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MRS. LOUDON'S

FIRST BOOK OF BOTANY.

BEING A PLAIN AND BRIEF INTRODUCTION
TO THAT SCIENCE,

For Schools and Young Persons.

NEW EDITION, REVISED AND ENLARGED

BY DAVID WOOSTER,

JOINT EDITOR OF "LOUDON'S ENCYCLOPÆDIA OF PLANTS"
"LOUDON'S HORTUS BRITANNICUS," ETC.

WITH NUMEROUS ENGRAVINGS.

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PREFACE.

In preparing this new edition of Mrs. Loudon's "First Book of Botany," some parts have been considerably extended, and numerous additional illustrations have been introduced throughout the work, in the hope of making it still more instructive and useful, and of retaining the popularity of the previous editions.

The botanic names have been accented to show the student on which syllable the emphasis is to be laid. It must be borne in mind that the accent is always on a vowel, and that every syllable must be pronounced whether accented or not. When the accent is acute, thus: á, it signifies that the consonant following the vowel is to be taken into the syllable;

and when the accent is grave, thus: à, that the vowel finishes the syllable. Thus, Ampelópsis is pronounced Am-pe-lop-sis, and armàta ar-ma-ta; while, as a proof that every syllable is pronounced, Agàve is called A-ga-vè, and Hepática He-pat-i-cà.

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THE FIRST BOOK OF BOTANY.

INTRODUCTION.

BOTANY implies a knowledge of plants, including their names and arrangement with relation to each other; their properties and uses; their habits of growth and native countries, and their construction and functions.

Botany thus comprising several distinct departments may be divided into three branches—namely, *Systematic Botany*, which includes the names and classification of plants; *Descriptive Botany*, which relates to their forms, properties and uses, habits of growth, and native countries; and *Vegetable Physiology*, which comprises all that is known of their construction and functions.

Before studying these branches in detail, it is necessary for the student to acquire the language of the science in which all botanical works are written. Very little, however, will be successfully accomplished unless the student is at the pains of examining real specimens; and for this purpose frequent visits should be paid at the proper seasons of the year to botanic and other gardens containing good, well-arranged, and accurately-named collections of British plants.

THE
FIRST BOOK OF BOTANY.

CHAPTER I.

OF THE ELEMENTARY ORGANS OF PLANTS.

The elementary organs of plants consist chiefly of cellular tissue, woody fibre, and vascular tissue.

Cellular tissue (pulp, or parenchyma), the only elementary organ universally found in plants (for the other forms are often either partially or entirely wanting), is composed of cells or vesicles, each vesicle being distinct from, and cohering with, the vesicle with which it is in contact. These vesicles (see fig. 1), when separate, are round or oblong, as at *a* and *b*; when only slightly and equally pressed together, as

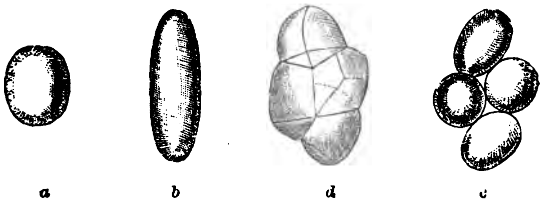


Fig. 1.—Cells or vesicles of Cellular Tissue.

at *c*, they acquire a dodecahedral appearance, as shown at *d*, and a section has the appearance of the hexagonal cells of the honeycomb (see fig. 2).

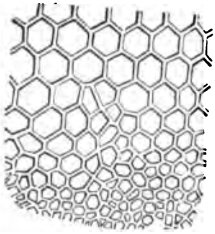


Fig. 2.—Section of irregularly compressed cellular tissue; the honeycomb appearance of the greater part is due to the 12-sided form of the cells, the walls of which, when cut across in any direction, present hexagons or 6-sided figures.

Cellular tissue increases very rapidly by the formation of new vesicles.

Cellular tissue is generally called *parenchyma* when the vesicles composing it fit together by their plane faces; and *prosenchyma* when the vesicles are fusiform or spindle-shaped. All the pulpy parts of plants consist of parenchyma: the medulla or pith, the medullary rays, a portion of the bark, the leaves, the fruit, the seeds, the roots. To the bark and wood prosenchyma is confined, occurring in them only occasionally.

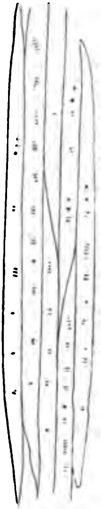
The office of the cellular tissue is to transmit fluids in all directions; therefore the membrane of which it is composed, though not generally furnished with visible pores, is permeable.

Woody tissue or fibre (pleurenchyma) consists of elongated tubes (see fig. 3), tapering to a sharp point at each end; and, like the vesicles of cellular tissue, it is without visible pores. It is distinguished by its cylindrical form, great length, extreme fineness, and toughness. It is found in the roots, the stem and branches, in the veins of the leaves, and, indeed, in all the woody parts of plants. It is the woody fibre which gives strength to plants; and it serves also as a medium for the passage of fluid from the lower to the upper extremities. It is to woody fibre that paper, linen, ropes, and other articles made from plants owe their strength.

Vascular tissue (trachenchyma) consists of very thin-sided membranous tubes, tapering at each end; and it is composed of *spiral vessels* and *ducts.*

Spiral vessels are membranous tubes with a fibre (of a highly elastic nature and capable of unrolling when stretched) twisted spirally round the inside. If the leaf of a hyacinth be broken, and the parts very gently drawn asunder, and held up to the light, the spiral vessels may be distinctly seen by the naked eye. Spiral vessels are found in all parts of the plant except the wood and the bark. They occur, however, even in these and other unusual parts in a few rare cases, as in the wood, and bark, and pith of the Nepénthes.

It is supposed that the spiral vessels are intended for the circulation of air throughout the plant.*



Woody tissue, or fibre.

(3.)

Usually the spiral filament (which appears to act as a special guard against the introduction of water into the cavity of the spiral vessel) is single (as at *a* in fig. 4); sometimes, however, it is double, or even triple, and in the very large spiral vessels of the Chinese Pitcher Plant (*Nepénthes distillatòria*) it is quadruple (as at *b*, in fig. 4).

---

* Dr. Lindley, in his "Ladies' Botany," says, an interesting experiment may be performed by placing the petal of a geranium between two pieces of perfectly smooth and flat glass which have been previously wetted with water. By pressing the two pieces of glass firmly together by degrees all the air will be squeezed out of the petal, and it will become transparent. "You may then," he continues, "with a pretty good magnifying power, observe all the air-vessels of the veins distinctly, looking like fine threads of silver wire twisted up like a spiral spring. It is on account of this appearance that the air-vessels are called technically *spiral* vessels."

Ducts (see figs. 5 and 6) are transparent tubes, the sides of which are marked with rings or bars arranged spirally. They are slight modifications of the spiral vessel, differing chiefly in not having the power of unrolling; and, in some cases, the turns of the spiral fibre will be found distant (as at *a*, in fig. 6) or broken (*b*, in fig. 6). Ducts occur among the woody tissue, and are large enough to be seen by the naked eye when a branch is cut across. They are supposed to convey fluids, but their functions have not been accurately determined.

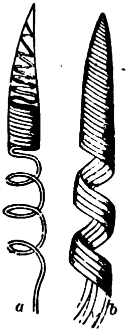


Fig. 4.—Portions of Spiral Vessels: *a*, common form, with single fibre partly drawn out; *b*, from Nepénthes, with the quadruple fibre.

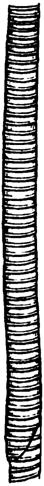


Fig 5.—Ducts.

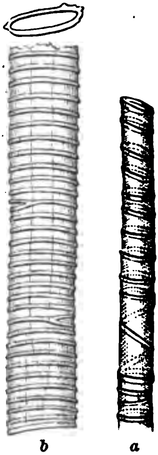


Fig. 6.—Ducts.

CHAPTER II.

OF THE PARTS INTO WHICH PLANTS ARE DIVIDED BY BOTANISTS.

A PLANT is divided by botanists into—the root, the stem, the leaves, and the flowers, from which last is produced the fruit, which contains the seeds. These (in perfect plants, that is, plants producing flowers) are called the *compound organs* of plants: the root, the stem, and the leaf (serving to nourish or support the plant) are called organs of nutrition; and the flower, the fruit, and the seed, are called organs of reproduction, as they enable the plant to continue its species.

THE ROOT.

The root is not only necessary to enable a plant to support itself in the ground, but it is the organ by means of which the plant takes its food. The true roots are fibrous substances, which consist of a number of ring-like cells united to each other, and covered with an elastic skin, which is quite entire, and will permit nothing to enter, or to pass through it. At the end of each *fibrous* root, however, is a part which is not covered with any skin, but which consists of a number of little pores which absorb water like a sponge; and hence this part of the root is called a *spongiole*, or *spongelet*, which signifies a little sponge. Now as the part of the root which is covered with a skin will not admit any liquid to pass through it, and as plants can take no food that is not in a liquid state, they can take no nourishment but what is absorbed by their spongioles; and the moisture that these little sponges suck up is forced onwards through the roots by the alternate expanding and contracting of the elastic skin, and it is thus sent on from cell to cell till it arrives at the main body of the plant. This has been shown by watering a plant with coloured water, and then taking it up carefully, and examining the roots with a microscope. The spongioles may easily be distinguished by the naked eye, as they are whiter and more delicate, and rather thicker than the other part of the fibrous root.

Besides the fibrous roots which serve to suck up moisture out of the earth for the use of the plants, there are some solid substances which are generally called roots, but which botanists consider as underground stems, or buds; and these contain a mass of nourishing feculent matter, which appears to have been laid up by nature for the plants to feed on when they cannot get their proper nourishment from the ground. Of this nature are the *tubers* of the potato, which will often send out long shoots in a cellar; the

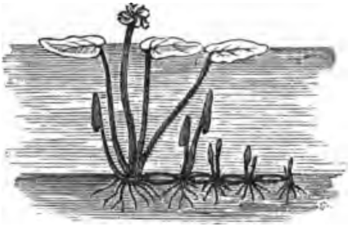


Fig. 7.—An Aquatic Plant extending its stems in the mud.

rhizomas, or thick fleshy roots of the water-lily; the *tap*, or *fusiform* root of the carrot, and the *globular* root of the turnip; the *fasciculated tubercles* of the dahlia and the garden ranunculus; the *granular*, or grain-like roots of the lesser celandine, and the mountain saxifrage; the *stoloniferous*, or creeping roots of the couch grass; the creeping stems of ferns (see fig. 8); the runners of the strawberry; and all the different kinds of *bulbs*.

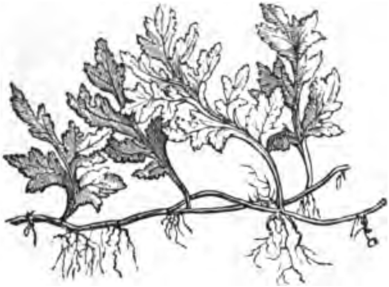


Fig. 8.—Creeping Stem of Fern.

Bulbous roots are divided into three kinds—namely, the *solid bulb* (which is also sometimes called a *bulb-tuber*, or a *corm*), like that of the crocus; the *tunicated* or coated bulb, like that of the hyacinth (see fig. 9) and the onion; and the *scaly* bulb, like that of the lily. All these often produce their flowers, without being planted in the ground, and sometimes even without moisture; though in this latter case the flowers are pale and imperfect, and the bulb becomes so exhausted by the effort that it can seldom be recovered. New bulbs of crocuses and other similar kinds form every year above the old bulb, which gradually wastes away, till only the outer skin is left, which forms a kind of ring round the base of the new bulb, just above the crown or part which throws out the fibrous roots. This may be seen by taking up a

crocus soon after it has done flowering, when the new bulb will be found half formed, and the old one half wasted away; and by taking another after the leaves have quite withered, when the new bulb will be found entire, and there will be nothing to be seen of the old bulb but the remains of the outer skin.

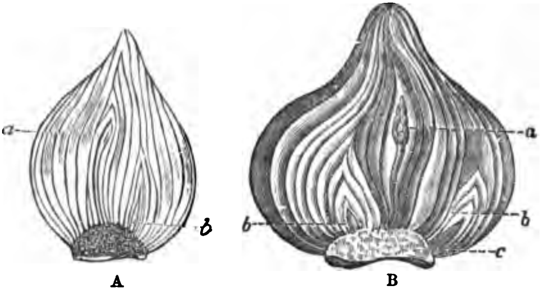


Fig. 9.—Sections of Bulbs: A, Tulip; B, Hyacinth; *a*, *a*, buds most advanced; *b*, *b*, buds less advanced; *c*, base of the bulb.

The main roots of large trees become encased in woody fibre, hardened on the outside till it looks like bark; and these spread widely, so as to serve as a base to support the spreading branches of the tree, but they are always furnished with slender fibrous roots ending in spongioles, the sole use of which is to suck the moisture out of the ground.

THE STEM.

The *stem* of a plant is the upright part which rises from the root, and supports the branches laden with leaves, flowers, and fruit; and stems are of two kinds

—namely, they are *ligneous*, or woody, when they belong to trees or shrubs, and last many years; or they are *herbaceous*, when they are soft and full of moisture, and die down to the ground every winter.

The stems of trees are called *trunks*, and they are composed of *pith*, *wood*, and *bark*, the wood becoming more solid every year, and the pith, which is in the centre, less. Young shoots and small branches are composed only of pith and bark, as are the stems of small shrubs; but the stems and branches of all ligneous plants become woody as the plants grow older.

The stems of herbaceous plants are generally solid and brittle when they are young; but they become hollow and tough when they get old. Flower stems are called *scapes* when they rise from the root, and *peduncles* when they grow from a branch or main stem. Leaf stems are called *petioles*.

The stems of herbaceous plants are sometimes round, when they are called *terete*; and sometimes square, when they are called *quadrangular*; but the stems and branches of trees and shrubs are always round or nearly so, and never square except when young.

THE LEAVES.

The leaves are as essential to the nourishment of a plant as the roots; for though the roots absorb the moisture which is to serve as food, yet this moisture cannot increase the size and strength of the plant till it is turned into sap, and this can only be done in the leaves. The leaves are furnished with a number of small pores called *stomata* (see fig. 10), which serve as *breathing places* to the plant, and permit the air to act through them on the moisture sent up to the leaves from the roots; and it is from the change that takes place in this liquid food from its being exposed to the action of the air, and its thin watery part evaporated through the stomata, that it is turned into a thick sugary juice called *sap*. The sap, when thus perfected, descends through the plant; some of it being deposited in every part as it passes along, till at last very little is left to reach the points of the roots. It is this deposition of sap which swells out the plant, giving strength and vigour to every part, and which makes it produce new leaves, and flowers, and fruit.

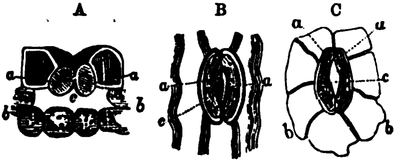


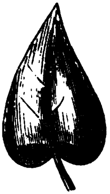
Fig. 10.—Views of Stomata:—A, vertical section of stoma of Iris; *a, a*, green cells bounding the orifice; *b, b*, cells of the parenchyma; *c*, air-chamber. B, view of the same from above; *a, a*, green cells of the stoma, lying between long cells of the cuticle; *c*, opening between them. C, similar view of a stoma of apple-leaf; *a*, cells of the stoma; *b, b*, cells of the cuticle; *c*, opening of stoma.

Leaves consist of two outer skins, which are termed the *cuticle*, a fleshy substance between them which is termed the *parenchyma*, and which is intersected by the *veins*, or *nerves*, as they are called by some botanists. The central vein is larger and stronger than the rest, and this is called the *mid-rib*, and when there are strong side veins branching out from this, the leaf is said to be *feather-nerved*. The veins in some plants are in straight parallel lines, and in others they are curiously intersected like net-work, when they are called *reticulated*. When the veins of two plants are arranged in different ways, the plants are said to differ in their *venation*. The *stomata*, or breathing pores, are in the cuticle of the leaf; and in the *parenchyma* are sometimes cells or glands filled with aromatic oil, as in the myrtle, which, when the leaf is held up to the light, look like transparent dots. When the cuticle of the leaf is broken by rubbing it between the fingers, the fragrant oil escapes from the cells, and smells much stronger.

The surface of leaves is sometimes *glabrous*, that is, quite smooth; and sometimes it is covered with down or hair. When leaves are slightly covered with down, they are said to be *pubescent*, if more so, they are called woolly or *tomentose*; and if the down should be white, they are called *canescent*. When leaves are covered with short erect hairs, they are said to be *pilose*, and the hairs are called *pili*; when leaves are covered with long hairs, they are called *villous*, and the hairs *villi*; and when the hairs are very long, shining, and white, and pressed close to the surface of the leaf, they are said to be *silky*. *Bristles* are short, stiff, rigid hairs; and *stings* are stiff, hollow hairs, which give out an acrid juice when touched.

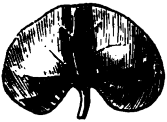
Leaves are of various kinds; but they may be all divided into simple and compound. Simple leaves are those that grow singly, and in one piece; but compound leaves are composed of several small leaves or leaflets.

Simple leaves are of so many different shapes, that Linnæus enumerates more than a hundred named kinds; but as most of these are very seldom met with, it will only be necessary here to mention the more common forms, which are the following:—



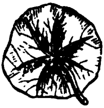
Cordate Leaf. (11.)

The cordate or heart-shaped leaf (fig. 11); the *obcordate* is when the leaf is reversed, and the stalk is fixed in what appears the point of the cordate leaf.

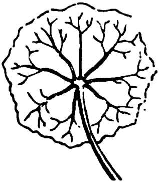


Reniform Leaf.
(12.)

The reniform or kidney-shaped leaf (fig. 12). This form is not nearly so common as the cordate leaf.

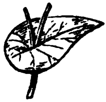


Peltate Leaf.
(13.)

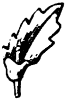


Peltate Leaf of the Marsh Pennywort.
(14.)

The peltate leaf (figs. 13 and 14), is where the shape of the leaf is nearly round, with the stalk in the centre, as in the garden nasturtium, the marsh pennywort, and others. Many water plants have leaves of this kind.

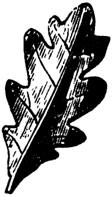


Perfoliate Leaf.
(15.)

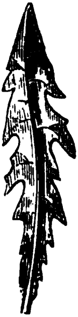


Stem-clasping.
(16.)

The perfoliate leaf (fig. 15), is like that of the common honeysuckle, in which the stem appears to pass through the middle of the leaf, and which differs in this respect from the *stem-clasping* leaf (fig. 16), in which the lower part of the leaf appears to be wrapped round the stem. This latter kind of leaf is also called *amplexicaulis.*



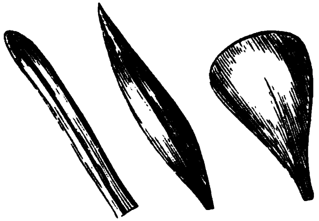
Sinuated Leaf.
(17.)



Runcinate Leaf.
(18.)

The *sinuated* leaf, like that of the oak (fig. 17), is deeply cut, with the *lobes* pointing upwards; and in this respect it differs from the *runcinate* leaf (fig. 18), like that of the dandelion, the lobes of which all point downwards towards the stalk.

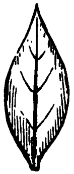
(19.) (20.) (21.)



Linear, Lanceolate, and Cuneiform Leaves.

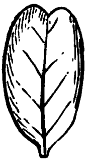
Linear leaves are long and narrow with a blunt point, as shown in fig. 19; *lanceolate* leaves terminate in a sharp point, as shown in fig. 20; and *cuneiform*, or wedge-shaped leaves (fig. 21) are much broader at the point than at the stalk.

Besides these, there are oval leaves, oblong leaves, arrow-shaped leaves, and many other kinds, the shapes of which will be easily understood by their names.



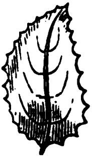
Acuminate.
(22.)

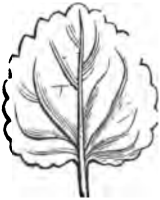
The extremities of leaves are distinguished by several different names. Sometimes the end of the leaf appears as though abruptly cut off, as in the tulip-tree, and these leaves are called *truncate;* and sometimes the leaf terminates in a point as shown in fig. 22, when it is said to be *acuminate.* When this point is hard and sharp, the tip is called a *mucro,* and the leaf is said to be *mucronate.* Sometimes the extremity of the leaf looks as though the point had been gnawed or bitten off, when the leaf is said to be *eroded;* and sometimes it looks as though it had a notch or slit in the middle, as shown in fig. 23, when it is said to be *emarginate.* Besides these terminations, the points of leaves are somctimes

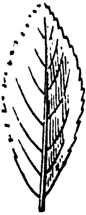


Emarginate.
(23.)

elongated into tendrils, and sometimes into singular, curiously-shaped appendages, as in the Chinese pitcher plant, *Nepénthes distillatòria;* and sometimes the petiole is dilated so as to resemble a leaf, as in some kinds of acacia.

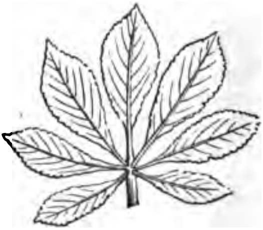

Dentate Leaf.
(24.)


Crenated Leaf.
(25.)


Serrated Leaf.
(26.)

The margins of leaves also differ very much: sometimes they are *dentated,* or toothed, as shown in fig. 24; and sometimes *crenated,* or scalloped, as shown in fig. 25. Sometimes the margins are quite smooth, and sometimes they are *serrated* like the teeth of a fine saw, as shown in fig. 26. The *ciliated* leaf has a smooth margin, edged with fine hairs like an eyelash; and the *undulated* or wavy leaf has the margin undulated like a flounce. The *crisped* leaf is only excessively undulated.

The outlines of the six different leaves represented in fig. 27, page 15, will show at a glance how greatly the margins of leaves vary.


Palmate Leaf.
(28.)

The commonest kinds of *compound* leaves are those called *palmate,* and those called *pinnate.* The palmate leaves have *three, five,* or *seven leaflets,* springing from one point at the extremity of the petiole or leaf-stalk, as shown in the leaf of the common horse-chestnut (fig. 28). The pinnate leaves have *five* or *seven* or more pairs of

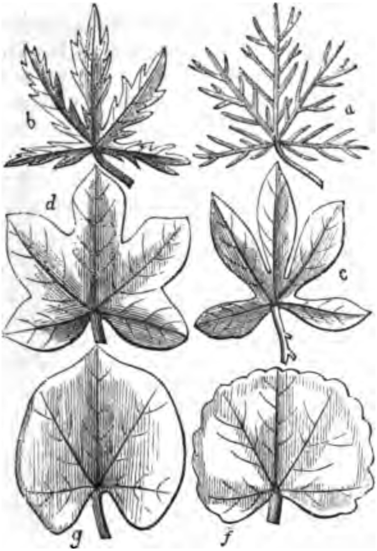
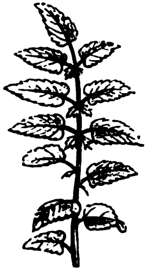
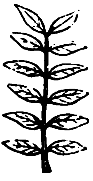


Fig. 27.—Different forms of Leaves having the same venation: *a*, Water Crowfoot; *b*, Jatropha; *c*, Passion-flower; *d*, Stercùlia platanifòlia; *f*, Dichondra; *g*, Asarabacca.

leaflets ranged on each side of a common stalk; and there are many different kinds, as, for example, the *impari-pinnate*, which is when the compound leaf ends in an odd leaflet, as shown in fig. 29, and the *abruptly pinnate*, which is shown in fig. 30. The leaflets in pinnate leaves, which are called *pinnæ*, are generally in pairs exactly opposite to each other, as



Impari-pinnate Leaf with Stipules. (29.)



Abruptly Pinnate Leaf. (30.)

shown in fig. 30; but sometimes they are irregularly placed towards the base, as shown in fig. 29. Sometimes the leaves are *decompound*, that is, twice branched, as in the leaves of many of the kinds of mimosa; and sometimes they are *supra-decompound*, as in those of the carrot. *Bipinnate* leaves (fig. 31) are where the leaflets of a pinnate leaf are themselves pinnate, as in the leaves of the *Acàcia Julibríssin*, and the common fumitory; *tripinnate* leaves (fig. 31) are when the leaflets (or only some of them) of a bipinnate leaf become themselves pinnate.

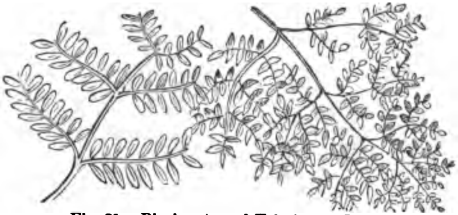


Fig. 31.—Bi-pinnate and Tri-pinnate Leaves.

Leaves are sometimes so deeply cut into lobes as to appear pinnate, though they are not divided into separate leaflets, as, for example, the leaves of some of the kinds of ferns; and these are called *pinnatifid*. Leaves are also frequently divided by very deep incisions; and when these are regular, the leaves are said to be *cut*, and when irregular, they are said to be *lacerated* or torn. When the incisions are very deep, and the segments of the leaf are sharply pointed, the leaf is said to be *laciniated*.

The position of leaves varies very much, and is always mentioned in describing a plant: as, for example, whether the leaves are in pairs opposite to each other, when they are said to be *opposite*, as in the mint, the maple, and other plants; or placed singly, first on one side of the stem and then on the other, when they are said to be *alternate*, as in the mignonette, the apple-tree, the cherry-tree, the lime-tree, and a large number of other plants. When they grow like a wheel round a joint in the stem, they are said to be *verticillate* or *whorled* (fig. 32); and when they lie over one another like scales, they are called *imbricated*, as in *Araucaria imbricàta* (the Chili Pine). When leaves are arranged in pairs that alternately cross each other, they are said to be *decussate* (fig. 33), as in *Pimelèa decussàta*. Leaves are sometimes attached to the stem or branches by short stalks called *petioles*, when they are said to be stalked; and when they grow on the stem or branches without any stalks, they are said to be *sessile*. The leaves that grow on the stems of herbaceous plants are called *cauline*; and those that spring from the root are the *radical* leaves. Floral leaves or *bracteæ* (fig. 34) are those which are produced on

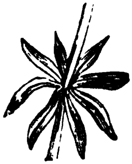


Fig. 32.

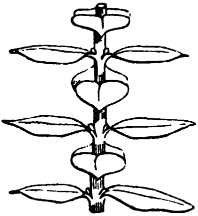


Fig. 33.—Decussate leaves of *Pimelèa decussàta*.

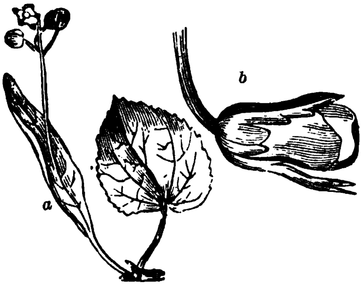


Fig. 34.—Bracts as they occur in the Lime (*a*), and the Hellebore (*b*).

the flower stem immediately below the flower, as in the lime-tree; when several of these are joined together, they form what is called an *involucre* (fig. 35). The covering of the filbert is an involucre.

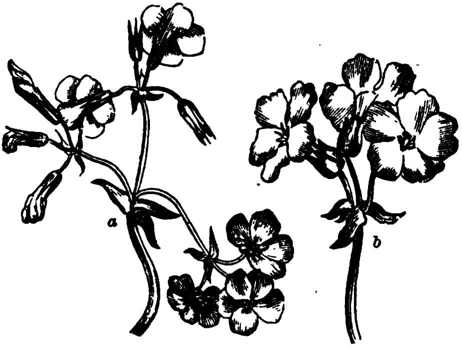


Fig. 35.—Involucre of a Phlox (*a*) and Chinese Primrose (*b*).

Stipules are small leaves growing at the base of the petiole of the true leaf, or at the base of each leaflet of a pinnate leaf, as shown in fig. 29, page 15. *Tendrils* are elongations of the points of the leaves, when the leaves are said to be *scirrhous;* or slender thread-like bodies proceeding from the stem, which are the proper tendrils, like those of the vine.

When the petiole of a leaf can be easily detached from the stem, it is said to be *articulated* or jointed; when leaves fall at the approach of winter, they are said to be *deciduous;* and when they remain on, after they have withered, like those of the beech and the horn-beam, they are called *persistent.*

Prickles are metamorphosed leaves, and as they are what is called *articulated,* they may be easily detached without tearing the bark or injuring the branch; as may be seen with the prickles of the rose-tree, which may be removed by slightly pulling them with the thumb and finger. This is not the case with *thorns*, which contain wood, and cannot be detached without tearing the bark. According to botanists, thorns are abortive branches, and they may often be seen in an imperfect state, as those of *Gledítschia hórrida*, which grow from the trunk of the tree, and those of the berberry, which spring from the axils of the leaves. *Spines* are the thorns of herbaceous plants; they do not contain wood, but they cannot be detached without injuring the stem or leaves on which they grow: as, for example, the spines on the spiny acanthus.

Leaf-buds (fig. 36) vary very much in different plants, not only in their outward appearance, but in the manner in which the young leaves are folded up in them. The manner in which the leaves are disposed or folded in the bud is called their *vernation;* sometimes the vernation is said to be *involute*, and this is when the young leaves form two rolls both bending inwards, as in the bud of the apple-tree. *Revolute* signifies when the young leaves form two rolls bending outwards, as in the bud of the rosemary; and *convolute* is when the leaves are rolled up in each other. The shape of the buds also differs considerably: in some plants they are long and slender and quite dry, as in the spindle-tree; and in others short and abruptly pointed, and covered with a kind of gum, as in the horse-chestnut.

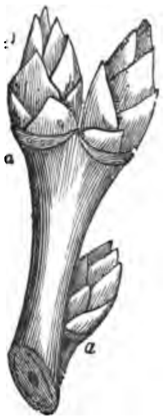


Fig. 36.—Leaf-buds about to unfold; *a*, *a*, marks of the attachment of leaves, just above which buds are always developed.

Some plants possess the power of producing buds on the edges of their leaves. The Bog-Orchis (*Maláxis paludòsa*) is one; and another is the East Indian *Bryophýllum calycìnum* (fig. 37).

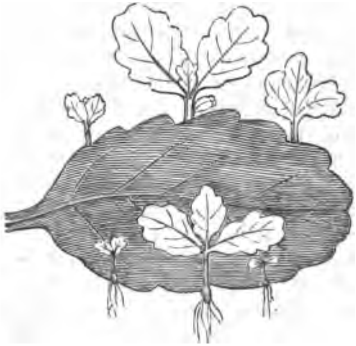


Fig. 37.—Leaf of Bryophýllum calycìnum, bearing buds at its edges.

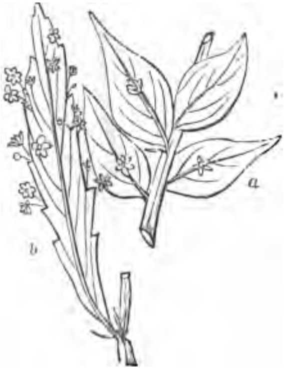
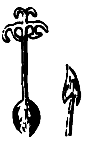


Fig. 38.—*a*, leaf-like branches of Butcher's Broom, bearing flowers in their centre; *b*, Xylophýlla.

In a few plants the branches are flattened into a leaf-like form, as in the common Butcher's Broom (*Rúscus aculeàtus*), the flowers arising from the midrib (*a*, in fig. 38), and as in *Xylophýlla,* in which the flowers appear around the edges (*b*, in fig. 38).

THE FLOWER.



Pistil and Stamen. (39.)

The flower is the most important part of every plant, because it contains within it the organs necessary for producing the seed. These organs are the *pistils* and the *stamens* (fig. 39); and to protect them, nature has provided a covering called a *calyx*, and sometimes two coverings called the *calyx* and the *corolla*, the two together forming what is called the *perianth* of the flower.

The *pistil* (fig. 39) consists of a globular or egg-shaped point at the base, which is called the *ovary*, or *germ*, and which afterwards becomes the seed-vessel; and to this is joined a long tube called the *style*, which spreads out at its summit into a fleshy substance called the *stigma*. In the ovary are one or more little substances called *ovulæ*, which afterwards become seeds. The ovary, which when ripe becomes the *carpel*, is generally divided into two or more cells, separated by membranous partitions, which are called *dissepiments*. Sometimes there is no style, and the stigma grows close to the ovary, and when this is the case, the stigma is said to be *sessile*.

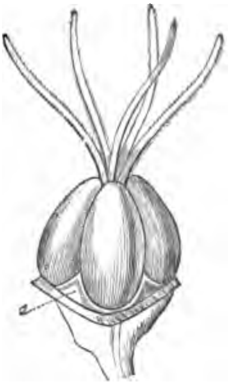


Fig. 40.—Pistil of Coriària myrtifòlia, showing distinct carpels and styles.

The *stamens* (different forms of which are shown in fig. 41) generally consist of long or short thread-like stalks called *filaments*, each bearing what is called an *anther*. The anther consists of one or more cells filled with a light dust or powder called the *pollen*, or *farina*, which is generally yellow, as in the lily and the rose, but sometimes black, as in the poppy. When the pollen is ripe, the cells of the anthers burst, and appear covered with a fine powder, which sticks to whatever may touch it. About the same time that the anther bursts, the stigma becomes covered with a glutinous moisture, which absorbs the pollen that falls upon it and conveys it down the style to the ovary, where its presence is necessary to perfect the young seeds, as without the pollen they would be abortive. Sometimes there are no filaments, and the anthers grow erect from the centre of the flower, in which case they are said to be *sessile*.

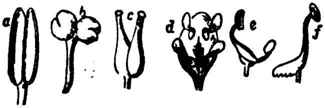
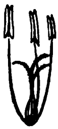


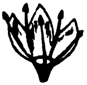
Fig. 41.—Different forms of stamens: *a*, lily; *b*, lemna; *c*, potato; *d*, berberry; *e*, ginger; *f*, sage.

When the anthers are attached to the filament by the back, or part opposite to that which is grooved, they are said to be *adnate*; and this is their most common form, as may be seen by examining the anthers of the rose and many other plants. When the anthers are attached by their base, as is shown in fig. 39, page 21, they are called *innate*; and when the anthers are so slightly attached in the centre as to quiver with every breath, they are called *versatile*.



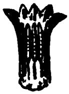
Hypogynous Stamens. (42.)

When the stamens grow from under the ovary, as shown in fig. 42, they are called *hypogynous*; and in this figure the ovary is shown with a sessile stigma, that is, there is no style. When the stamens grow out of the ovary, they are called *epigynous;* and when they grow to the calyx, as shown in fig. 43, or to the corolla, as shown in fig. 44, they are said to be *perigynous*—this last word being used in all cases where the stamens grow apart from the ovary.



Perigynous Stamens growing out of the Calyx. (43.)

Sometimes the stamens are in one flower, and the pistils in another; and when this is the case, the stamen-bearing flowers are called the males, and the pistil-bearing flowers the females, and the latter only produce seed. When flowers of both kinds are on one plant, the plant is called *monœcious;* and when they are on different plants (as in the *Aúcuba japónica,* and in the Willows), the plants are said to be *diœcious.*



Perigynous Stamens attached to the Corolla. (44.)

The *calyx* and the *corolla.*—Where there is only one covering to the stamens and pistil, it is called the *calyx* (different forms of which are shown in figs. 45 to 50); but when there are two coverings, the outer one is called the *calyx,* and the inner one the *corolla.*

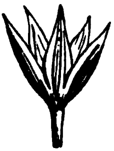


Fig. 45.—Calyx of the Greater Stitchwort (*Stellària Holóstea*).

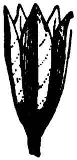


Fig. 46.—Calyx of the Oxlip (*Prímula elàtior*).

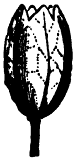


Fig. 47.—Calyx of the Bladder Campion (*Sìlène inflàta*).

Generally the calyx is green when there is a corolla; but when there is none, it is coloured, as is the case with the clematis, what we call the flower being only a coloured calyx. The divisions of the calyx are called *sepals*; and those of the corolla are called *petals*. Sometimes the calyx and the corolla are both coloured and so mixed together as not to be easily distinguished, as in the iris and many kinds of bulbous plants; and when this is the case, the divisions are called the *segments* of the *perianth*. Sometimes the stamens and pistils are without any covering, in which case the flowers are said to be *apetalous*.

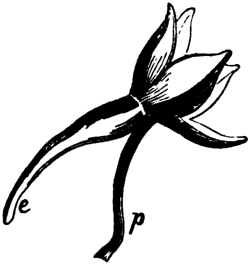


Fig. 48.—Calyx of the Indian Cress; *e*, spur; *p*, pedicel.

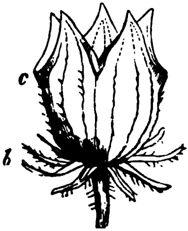


Fig. 49.—Calyx (*c*) of a Hibíscus with its calyculus (*b*).

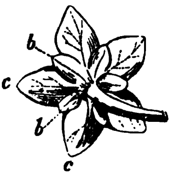


Fig. 50.—Calyx (*c*) of *Potentílla vérna*—its under side with its calyculus (*b*).

When the calyx and the corolla grow above the ovary, it is said to be *inferior*; and when they grow from below it, the ovary is said to be *superior*. Sometimes the flowers fall before the fruit begins to swell, and then they are called *caducous* or fugitive, as in the poppy; but when the ovary is inferior, and the calyx remains on till the fruit is ripe, it is called *persistent*. The apple is an example of an inferior ovary with a persistent calyx; what is called the eye of the apple being the persistent calyx, and the fruit itself the ovary.

The *corolla* is either formed of one petal, when it is said to be *monopetalous* (see fig. 51), or of several, in which case it is said to be *polypetalous* (see fig. 52).

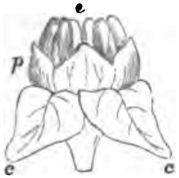


Fig. 51.—Very young flower-bud of a monopetalous flower, with the divisions of the calyx (*c*) bent down to show the corolla (*p*) and stamens (*e*).

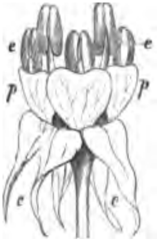


Fig. 52.—Young flower-bud of a polypetalous flower: *c*, calyx; *p*, corolla; *e*, stamens.

The *monopetalous* corolla consists of three parts: the *tube*, or *cylindrical* part; the *mouth*, or *throat*, which is sometimes also called the *faux*; and the *limb*, or *spreading* part. There are many kinds of monopetalous corollas, but the principal are the following:—

The *campanulate*, or bell-shaped, like the Canterbury-bell; the *infundibuliform*, or funnel-shaped, as in the convolvulus; the *hypocrateriform*, or salver-shaped, as in the primrose and the jasmine (see fig. 53); the *rotate*, or wheel-shaped, as in the speedwell;

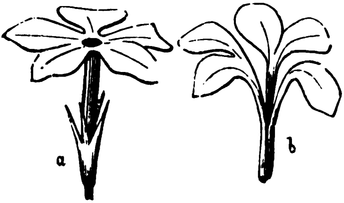


Fig. 53—*a*, monopetalous corolla; *b*, monstrous form of the same.

the *urceolate*, or pitcher-shaped, as in the Cape heaths; the *ringent*, *gaping*, or *labiate*, as in the flowers of the common sage; the *masked*, or *personate*, as in the snapdragon; the *spurred*, or *calcarate*, as in the larkspur.

The polypetalous corolla has also many shapes; and its petals are in many cases divided into two parts, one long and narrow, which is generally partly hidden by the calyx, and which is called the *unguis*, or claw, and the other a spreading part, which is called the *lamina*, or limb (see figs. 54 and 55). Sometimes the limb is bent, as in fig. 56. In Orchideous, and some other plants, the limb of one petal is sometimes lengthened and curved upwards, when it is called the *labellum*, or lip.

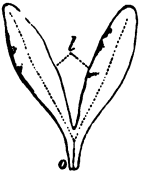


Fig. 54.—Petal of the Chickweed (*Alsìne mèdia*): *l*, limb; *o*, claw.

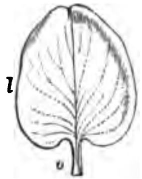


Fig. 55.—Petal of *Genísta cándicans*: *l*, limb; *o*, claw.

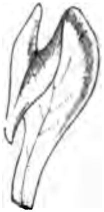


Fig. 56.—Petal of *Erýngium campéstre*.

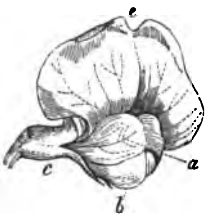


Fig. 57.—Flower of the Sweet Pea (*Láthyrus odoràtus*): *c*, calyx; *e*, standard; *a*, wings; *b*, keel.

The most remarkable of the polypetalous corollas, are the *cruciform*, so called because they consist of four petals, arranged so as to form a Greek cross, as in the wall-flower, the stock, and other cruciferous plants; and the *papilionaceous*, or pea-flowers (see fig. 57). In these last, the large upright petal is called the *vexillum*, or standard (*e*); the two small side ones the *alæ*, or wings (*a*); and the two lower petals which appear joined together, the *carina*, or keel (*b*).

The *nectary* is a petal-like appendage to the flower, generally curiously folded up, which has received its name from its being formerly supposed to be a receptacle for honey.

The *flower-buds* are interesting, from the different manner in which the petals of different flowers are folded in them, and this is called their *æstivation*. In some cases, as, for example, in the poppy, they are *wrinkled*, or *crumpled up*; and in others, as in the convolvulus, they are *twisted*, or *convolute*.

The *inflorescence*, or position of the flowers with regard to each other, is another point noticed by botanists. Flowers are either *terminal*, that is, they grow at the extremity of the shoots; or *lateral*, that is, they spring from the sides of the branches. They are also produced either *singly*, or in *clusters*, and these clusters are generally of one of the following kinds:—

A SPIKE,

which is when the flowers grow round a long upright stalk, without having small separate stalks to each flower, as in the common veronica, or speedwell, and in most grasses. (See fig. 58.)

(58.)

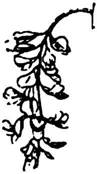
A CATKIN

is a pendant spike, the flowers of which have neither calyx nor corolla; as the catkin of the hazel, the birch, or the willow. (See fig. 59.)

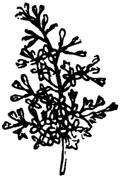
(59.)

A RACEME

is either an upright or a drooping spike, the flowers of which have separate small stalks to each: as, for example, the flowers of the common currant, the laburnum, the Wistària, and the rose acacia. (See fig. 60.)



(60.)



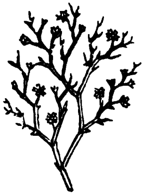
(61.)

A THYRSE

is a close, upright, branched raceme, like that of the lilac. (See fig. 61.)

A PANICLE

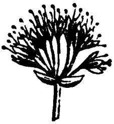
is a loose raceme, with branched stalks to the separate flowers, like a panicle of oats, or a tuft of sea lavender. (See fig. 62.)



(62.)

AN UMBEL

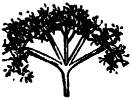
is where the flowers have separate stalks springing from a common centre, but of unequal length, so as to form a head level at top as in the common parsley. Sometimes the *umbel* is not quite level at the top, as in fig. 63.



(63.)

A CYME

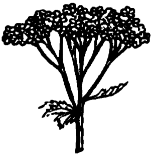
is an umbel with branched stalks, which make the bunches of flowers round instead of flat at the top, as in the elder. (See fig. 64.)



(64.)

A CORYMB

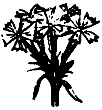
is a cluster of flowers, nearly level at the top, but growing on stalks of different lengths from different parts of the main stem, and not from a common centre, as in the common milfoil. (See fig. 65.)



(65.)

A FASCICLE

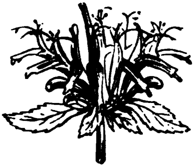
is a close corymb, with the flowers on short stalks, so as to form a little bundle, as in Lobel's catchfly. (See fig. 66.)



(66.)

A WHORL

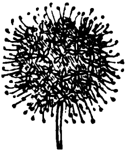
is where the flowers grow round a joint in the main stem of the plant, as in the dead nettle. (See fig. 67.)



(67.)

A HEAD

is when a number of small flowers grow so close together on a common receptacle as to seem but one flower, as the daisy, or the globe amaranth. (See fig. 68.)



(68.)

In addition to these may be mentioned a *spadix*, in which the flower is sheathed in a large leaf called a *spathe* (see fig. 69), as in the arum, and in the *Cálla*, or *Richárdia œthiópica.*

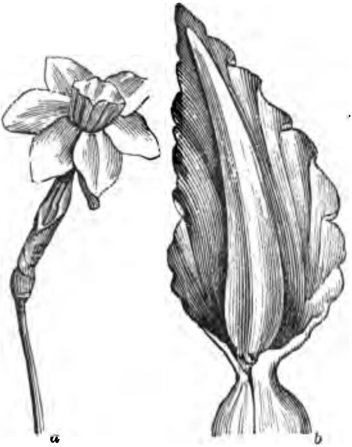


Fig. 69.—Spathe of Narcíssus (*a*) and Àrum (*b*).

THE FRUIT AND SEED.

The *fruit.*—In the language of botanists every seed-vessel is called a fruit, though it is sometimes dry and membranous, and sometimes covered with a fleshy or pulpy substance. The principal kinds of fruits are the *legume*, or pod, like those of the pea and bean, and allied to which are the *silique*, and the *silicle*, which contain the seeds of cruciferous plants; the *nut*, like that of the hazel; the *drupe*, or stone-fruit, as the peach or plum; the *pome*, or kerneled fruit, as the apple or pear; the berry, or *baccate* fruit, as the currant; the *acorn;* the *capsule*, like that of the pæony; the *samara*, or key, like that of the maple; and the *achenium*, or dry fruit, like that of the sunflower, the achenium having very frequently a feathery wing attached to it called the pappus.

An example of the achenium, with its pappus attached, may be seen in the seed of the dandelion, or in that of the thistle; and the use of these feathery wings is to carry the seed to a distance, and thus to scatter it, instead of letting it all fall in one place, where it would be too crowded.

Seed vessels, if when ripe they open naturally to let out the seed, are said to be *dehiscent*; and *indehiscent* when they do not open in this manner. The pod of a pea is *dehiscent,* and the parts into which it splits are called *valves;* while the part to which the peas are attached is the *placenta.* Most seeds have a placenta to which they are attached, but in some cases it grows in the middle of the ovary without adhering to the sides, when it is said to be *free-central;* and at others it grows from the sides, and is open in the middle, when it is called *parietal.* When capsules are divided into several cells, the membrane which divides them is called the *dissepiment;* and when the cells separate from each other to discharge the seed, the dehiscence is said to be *septicidal;* but when they remain together and only open at the *dorsal suture,* in the middle of the back of each cell, the dehiscence is *loculicidal.* *Carpels* have two natural places for opening, which are called the *dorsal* and *ventral sutures;* and both these may be seen in the pod of the pea, the *ventral* suture being that to which the placenta with the peas is attached. The covering of the seed when not membranous is called the *pericarp;* and this in stone fruit is divided into three parts—namely, the skin or *epicarp,* which may be easily peeled off, the fleshy eatable part called the *sarcocarp,* and the hard covering of the kernel or stone, which botanists call the *putamen* or *endocarp.* The real seed is the kernel contained within the stone. Most of the kerneled fruits are indehiscent, and if left to nature must decay before they can liberate the seed. The gooseberry and the currant are true berries, that is, when ripe, their seeds lie buried in a mass of pulp, but the raspberry, the strawberry, and the mulberry are not true berries—the raspberry and mulberry being a collection of fleshy drupes with a stone in each, on a dry receptacle, and the strawberry bearing its seeds on the outside of a fleshy and eatable receptacle.

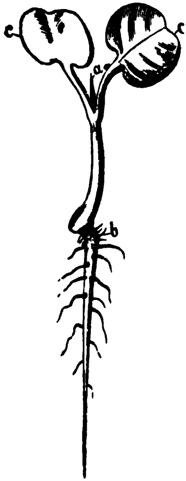
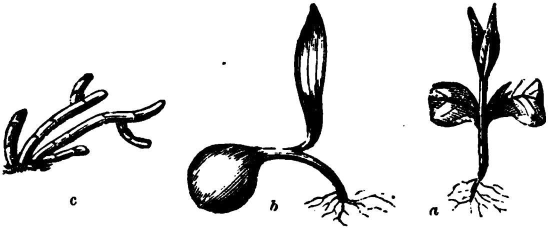


Fig. 70.—Germination of dicotyledonous Seed: *a*, plumule; *b*, radicle; *c*, *c*, cotyledons.

Seeds when perfect contain the embryo of the future plant: sometimes the entire seed is occupied with this embryo, as in the bean; but in others the embryo is found folded up in many different forms, and buried in a mass of feculent matter, called the *albumen.* Every embryo consists of three parts (see fig. 70): the *radicle,* or root (*b,* in fig. 70), the *plumule,* or germ of the future plant (*a,* in fig. 70), and the *cotyledons,* or seed-leaves (*c, c,* in fig. 70), which fall off soon after the true leaves begin to expand. Some plants have two cotyledons, or seed leaves, and are called *dicotyledonous* (fig. 71, *a*); others have only one, when they are called *monocotyledonous* (fig. 71, *b*); and this difference constitutes the distinguishing mark between the two great classes of flowering plants, according to the Natural System. The plants which bear no flowers, such as the fungi, lichens, sea-weeds, mosses, and ferns, have no cotyledons; and are called *acotyledonous* (fig. 71, *c*).

Fig. 71.



Acotyledòneæ.
Crow-silk.
Confèrva.

Monocotyledòneæ.
Cocoa-nut.
Còcos.

Dicotyledòneæ.
Mustard.
Sinàpis.

The seed is covered with a *testa*, or skin, on which is a little mark called the *hilum*, or eye, which shows where the seed has been attached to the placenta. In some plants the hilum is very visible, and the American horse-chestnut (*Pàvia*) is called buck-eye by the inhabitants, from the hilum of the fruit having the appearance of a stag's eye. Sometimes there is a kind of cord along the seed called the *raphe*, which reaches from the hilum to a point at the other extremity of the seed called the *chalaza;* and this may be plainly seen in the seed of a lemon.

Sometimes the seed is attached to the placenta by a short stalk called a *funicle,* like the pea; and in other cases it hangs even when it is ripe by a long string, or thread, called an umbilical cord, like the seed of the magnolia, or by a kind of loose skin called an *arillus,* like the seed of the spindle-tree.

The ferns, mosses, fungi, &c., have neither flowers nor seed, properly so called; but in lieu of the latter, they are furnished with minute granular bodies called *spores,* or *sporules,* which when sown become distinct plants. These sporules differ from seeds, in not requiring to be fertilized by pollen, and also in their construction; and they are produced in little cases called *thecæ*, which in the ferns appear usually on the back of the frond, or leaf (see *a*, in fig. 72), being

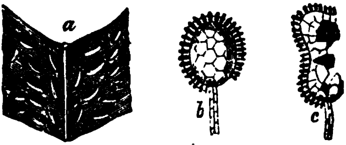


Fig. 72.

attached by short stalks (as seen at *b*), and burst when ripe (as seen at *c*). In the mosses, the thecæ are produced on long stems, and are covered with a kind of cap called a *calyptra*, which detaches itself and drops off when the sporules are ripe. The mushrooms and other kinds of fungi have their thecæ and sporules among the *laminæ*, or gills as they are called, below the *pileus*, or cap; and the lichens and seaweeds have theirs curiously protected, and admirably adapted to the situations in which they are produced, and in which they are to grow. In short, the meanest objects in the vegetable kingdom have been as wonderfully contrived, and show as evidently the Divine wisdom by which they have been organised and fitted for the stations they are to fill as the noblest forest tree; and the more we study to unfold the secrets of Nature, the more we shall feel impressed with awe and admiration of that beneficent Being who has made all these wonders, and given them to us for our use.

CHAPTER III.

OF THE NATURAL DIVISIONS OF PLANTS.

PLANTS are naturally divided into *ligneous* and *herbaceous, evergreen* and *deciduous*, and *flowering* and *not flowering;* and these grand divisions are sub-divided into many smaller ones.

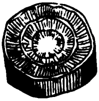
LIGNEOUS PLANTS.

All plants that have hard woody stems are called *ligneous;* and these plants last several years, producing flowers and fruit every season after they have attained the age of maturity.

All ligneous plants must be either trees or shrubs.

TREES.

Trees have one upright stem or trunk, rising from the root, and growing to a considerable height before it divides into branches, and-they are of three kinds: namely, dicotyledonous, monocotyledonous, and acotyledonous. The trunk and branches of *dicotyledonous* trees are composed of *pith, wood,* and *bark.* At first, the substance within the bark is little more than pith; but as every year the sap deposits a layer of wood between this substance and the bark, which presses against the previous layers so as to contract them, these press also against the pith, which becomes smaller every year, till at last in old trees it is scarcely perceptible. These layers of wood are always perfectly distinct from each other; and, as only one is deposited every year, when a tree is cut down its age may be counted from them, as may be seen in fig. 73 (which shows a section of the stem of a young oak, three years old, with a large proportion of pith in the centre), and by the two sections shown in fig. 74. When trees grow rapidly, the layers of wood are broad, and of comparatively coarse texture; but when trees grow slowly, the layers of wood are narrow, and the wood is very hard.



Wood of a young Oak. (73.)

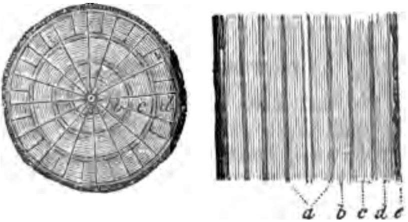


Fig. 74.—Transverse and Perpendicular Sections of a Stem four years old; the latter through the pith. *a*, pith and wood of the first year; *b*, *c*, *d*, layers of wood of the second, third, and fourth years; *e*, the four thin layers of bark.

As the bark of the young tree would be too tight for the tree when the size is increased by the annual deposition of fresh wood within it, it is gifted with a power of extending itself considerably, and a deposition of new bark takes place also every year within the old bark, so that when the old bark can bear no farther distension, but cracks and peels off, there is a new bark within to supply its place. The inner layer of bark is called the *liber*. It is the liber of the lime-tree which is manufactured into what we call bast mats. These mats are made principally in Sweden and Russia, on the shores of the Baltic; and as the bark of trees is in these countries called bast, the mats hence derive their name. The word is sometimes written and pronounced bass, but this is only a corruption of the true name.

The new wood of the tree which is deposited every year is called *alburnum*, or sap-wood, and it may be easily distinguished from the hard wood, when the tree is cut down, by its lighter colour and porous texture. As soon as a new layer of alburnum is deposited, the alburnum of the previous year changes its colour and becomes harder, and the layers within that harden in proportion; thus as the wood continues every year to grow harder and harder, the pith disappears, and the wood near the centre of the tree, which is the oldest, becomes the best; and hence the excellence of what is termed "heart of oak," in old oak-trees.

Besides the layers, the wood of *dicotyledonous* trees is marked with slender divergent lines, proceeding from the centre to the bark, as may be seen in fig. 74, and at *c* in the illustrative diagram, fig. 75; these lines are called by botanists *medullary* rays (*c, c, c,* in fig. 75), and they produce the wavy lines or veins observable in worked timber. The knots are where there have been branches.

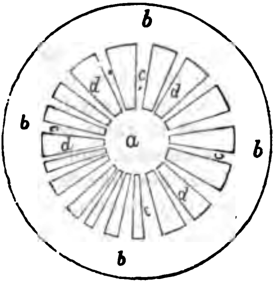
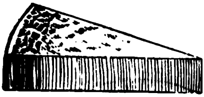


Fig. 75.—Diagram illustrating the formation of the Stem. *a*, pith; *b*, bark; *c, c, c*, plates of cellular tissue connecting them, termed medullary rays; *d, d, d*, woody bundles interposed between these.

The stems of trees are called *trunks* up to the place where they divide into branches, and form what is called a head. The largest and thickest branches are called *limbs*, and the smaller ones *boughs*, *twigs*, or *spray*. The annual growth of every season is called the *young shoots* of the current year. When the head of a tree is cut off, it is called the *lop*, and the old trunk which is left to send up young shoots, is called a *pollard*.

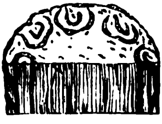
The roots of trees being intended to support a heavy branching head, are very large and strong, and are generally spread over a considerable extent of ground to afford a sufficient base to support the tree. Those of the oak descend deeply into the ground, while those of the elm, the beech, and several other trees spread near the surface; and hence these trees are more easily blown down by high winds than oaks are.

Monocotyledonous trees are only found within the tropics. Their wood is more fibrous than solid, and when cut down it seems full of pores; its nature may be seen by cutting across a rattan cane, or by examining the wood of a palm-tree—see fig. 76. These trees have neither annual layers of alburnum nor medullary rays; and their trunks increase very little in thickness during the whole period of their growth, the newly-formed fibrous matter which is deposited in their centre every year only rendering them somewhat more solid. These trees have never any branches, like those of the trees of Europe.



The wood of a Palm-tree.
(76.)

The only ligneous plants belonging to the *acoty-*



The wood of a Tree-fern.
(77.)

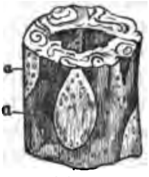


Fig. 78.—Portion of the stem of a Tree-fern.
a, a, scars of former leaves.

ledons are the tree ferns, the wood of which (see fig. 77 and fig. 78) appears in zig-zag lines when cut across, and which has been supposed to consist of a bundle of petioles growing together after the decay of the leaves or fronds to which they belonged. Very little, comparatively, however, is as yet known respecting these plants.

SHRUBS.

Shrubs differ from trees in being much smaller in size, and in generally having several stems of nearly the same thickness, instead of one large trunk rising to a considerable height without a branch, and then forming a large head. Shrubs are of many kinds, the principal of which are *bushes*, *trailers*, *creepers*, *climbers*, and *twiners*.

Bushes are large upright shrubs, generally growing several feet high, and either consisting of numerous small stems rising from the ground of nearly equal thickness, like the common lilac; or of more compact roundish bushes, rising from the ground with several stems, like the gooseberry.

Trailing shrubs lie on the surface of the ground, spreading over it to a considerable extent, but without rooting into it, like the common periwinkle; these shrubs may be trained up a tree or a wall, but they require tying or nailing.

Creeping shrubs are those that lie on the surface of the ground, and root into it at every joint; as, for example, the ivy. These plants will creep up a tree, or against a wall, without any fastening but what is afforded by their own roots, which will attach themselves to the bark of the tree, and penetrate into the crevices of the wall.

Climbing shrubs have long slender tendrils, by which they attach themselves to any object that may be near them, twisting their tendrils backwards and forwards in a most extraordinary manner, so as to take a firm hold. The *Cobœa scándens* is an example of a well-known plant of this kind; and it will twist its tendrils so firmly round any other plant that may be near it as frequently to kill the branch it has attached itself to.

Twining shrubs are without tendrils, and they support themselves by twining round any object that may be near them. Familiar examples of twining plants are the honeysuckle and the convolvulus; the latter, though herbaceous, being here mentioned as a familiar example of the different manner in which these plants twine themselves round the objects that are to support them, the convolvulus always growing from the right to the left, and the honeysuckle from the left to the right. Sometimes twining shrubs support themselves.

HERBACEOUS PLANTS.

This division includes all plants that have not woody stems; and they are of three kinds, viz.:—perennials, biennials, and annuals.

Perennials are plants that live several years, bearing flowers and fruit every year, and, when they die down to the root in winter, send up fresh shoots in spring. Some herbaceous perennials do not die down to the ground in winter, but retain green leaves all the year, for example, the pink and carnation.

Biennials are plants that live two years, requiring to be sown in spring, and not flowering till the second summer. Sometimes these plants will live three or four years, as, for example, the wallflower and the hollyhock.

Annuals are plants that live only a single summer, requiring to be sown every spring, and dying when they have ripened their seed; as, for example, the sweet-pea.

To these may be added *Suffruticose plants*, which are those the stems of which are half woody and half herbaceous, and which do not die down to the ground in winter. The tree-pæony is a suffruticose plant.

EVERGREENS.

Evergreen plants are those that do not lose their leaves in winter, and which, though they change their leaves every year, yet, from only losing a few at a time, are never left entirely bare. The principal evergreen large trees grown in England belong to the pine and fir tribe, including the cedars and the yew. The pines and firs and cedars are what are called the needle-leaved trees; and these trees, when once cut down, never send up shoots from the root; they also never send up any suckers. They abound in turpentine, from which is made pitch and tar, and their fruits are called cones. The larch, though belonging to the pine and fir tribe, is not an evergreen, as it loses its leaves every winter.

The holly is the most common evergreen small tree in British gardens, and the laurel, the aucuba, and the laurestinus are three of the principal evergreen shrubs. All evergreens are particularly well suited to the moist climate of England, and still more so to that of Ireland; but they seldom thrive so well on the continent, where the summers are much warmer, and the winters frequently much colder.

DECIDUOUS TREES.

These plants lose their leaves every autumn, and send out fresh ones every spring; and thus, as they have a season of complete repose during winter, they succeed in a climate that is very hot in summer and very cold in winter, better than in one that is more nearly equal all the year. Deciduous trees differ also from evergreen trees in throwing out fresh shoots from the roots when they are cut down, and in frequently throwing up suckers, which evergreen trees never do. They are also generally propagated by seeds, layers, or cuttings, while some of the evergreens are almost always increased by seeds or by grafting. All ligneous plants that send up fresh shoots from the collar of the root when they are cut down are said to *stole.*

SUCCULENT PLANTS.

Succulent plants partake of the nature of evergreens, in not undergoing any change when they are in a healthy condition during winter; but they differ from all other plants in the brittle and juicy substance of their stems, and in the little distinction that has been made by nature between their stems and leaves. They also differ from other plants in having scarcely any stomata or breathing pores, one of the uses of which, it may be remembered (see p. 10), is to carry off the superfluous moisture; and hence succulent plants are admirably adapted for the burning sands in which they grow in their native countries; their want of stomata rendering them exactly fitted for a hot dry atmosphere, in which the evaporation from leaves abundantly furnished with stomata would be so great as to render constant watering necessary to enable the plants to endure it. It is for this reason that succulent plants are so easily killed in England; for if too much water be given to them, the leaves have no means of throwing it off, and they become rotten; or, as gardeners term it, they damp off.

There are many kinds of succulent plants, but the most important are the *mesembryanthemums*, or *fig-marigolds*, and the *cacti*. The ice-plants, which are two species of mesembryanthemum, are remarkable for the glistening papulæ or blisters that form under the cuticle, and which, being full of a half-transparent substance, make the plants look as though they were covered with ice. The cacti are still more remarkable: the tallest kinds of cereus, or torch-thistle, grow in their native country (Brazil) to the height of thirty or forty feet, without a single branch or even leaf, and with a fleshy angular stem, covered with spines. The opuntias or Indian figs appear, on the contrary, to have no stems, but only a succession of flat succulent leaves joined together: it is on one of these plants (the *Opúntia cochinillífera*) that the cochineal insect is found. Other kinds of cacti are nearly globular; and others have a kind of cap on their summit, which resembles a great muff. They have all brilliant flowers, and many of them are armed with fearful spines. Their great use, however, in their native country, is to serve as reservoirs of moisture for men and animals, who can suck the juice from their fleshy stems in places where no other kind of liquid can be procured.

PARASITES AND EPIPHYTES.

Parasites are plants that live upon other plants, and not upon the ground, sending their roots down into the soft wood, and drawing their nourishment from the plants to which they cling for support. The mistletoe and the dodder are two of the best known parasitic plants in Britain. The first of these (the mistletoe) grows at once on the branch of a tree, from its fruit being crushed by birds, or the seed dropped accidentally against some part of a branch, where a fissure in the bark enables it to insinuate its roots. The dodder, on the contrary, springs from the ground: though, when it has taken firm hold of some unfortunate plant, its root withers, and it feeds entirely on the sap of the plant to which it has clung. Both parasites are injurious, but the dodder is decidedly the most so.

Epiphytes differ from parasites in not deriving any nutriment from the trees on which they grow. The Orchideous epiphytes are, properly speaking, air plants; and, contrary to the habit of terrestrial plants, their roots do not bury themselves in the soil, but they hang down in the air. They are found in their native countries (the tropical parts of South America, Mexico, and the East Indies) in close damp woods, growing on the branches of trees, with their rich and fantastic flowers hanging down as a sort of natural drapery. In England, most of these plants can only be grown in great heat and a very moist atmosphere; and instead of being planted in pots, they are generally tied with a little moss to portions of the branches of trees with the bark on, which are hung up by pieces of string or wire to the roof of a hothouse. All these plants belong to the natural order Orchidàceæ.

HARDY, HALF-HARDY, AND TENDER PLANTS.

Hàrdy plants, in British gardens, are those that will bear the climate of England without any protection during winter. *Half-hardy* plants are those which require protection during winter, but which may be grown in the open ground during summer; and *tender* plants are those which require to be kept in plant-houses all the year.

CHAPTER IV.

OF THE BOTANICAL DIVISIONS OF PLANTS.

USE OF CLASSIFICATION.

FROM the earliest times in which we have any record of the study of plants, botanists appear to have felt the want of some mode of throwing them into groups so as to aid the memory in retaining their names. Thus it is easier to remember the general name of rose for all roses than it would be to remember these flowers if all the numerous species and varieties of roses now grown in gardens had names not bearing the slightest resemblance to each other. We now, for example, when we hear that a plant is a rose, have a general idea of its nature and habits without knowing what kind of rose it may be; but if all roses had quite distinct names, as, for example, if one were called Polyhýmnia vulgàris, and another Nepeltròdia commùnis, &c., it would be necessary to know all these names, and all the flowers distinguished by them, before the name of any plant could convey the slightest idea to the mind as to what the plant was.

The necessity of classing together those plants which resemble each other being thus evident, the only difficulty which remained was to know what parts of the plant should be compared to discover which plants did most resemble each other; and on this score the most eminent bòtanists have differed. Some, as, for example, Tournefort, chose the flower, and placed all the plants that had cup-shaped flowers in one class, and those that had bell-shaped flowers in another, and so on. Others, as, for example, Cæsalpinus, took the fruit for the point of comparison, and put all the plants with globe-shaped fruits into one class, those having flat fruits into another, &c. None of these, however, were much followed, and no general system of classification was adopted till the time of Linnæus, who fixed on the number of the stamens and pistils contained in each flower as the standard of comparison. This plan soon became popular, as it seemed to enable every one who could count to become a botanist; and it has some followers even at the present day.

The system of Linnæus was, however, very imperfect, from the frequent variations that occurred in the number of stamens and pistils, sometimes even in flowers on the same plant, and very frequently in plants that evidently resembled each other in all other respects. To obviate these difficulties Linnæus devised what he called a Natural System, by which those plants should be classed together which resembled each other in most particulars, but unfortunately he died before he could carry his ideas fully into effect. In the meantime, Bernard de Jussieu had invented the Natural System which now bears his name, and which has since been very much altered and modified by other botanists.

The system of Linnæus is called an Artificial System, because, as it depends entirely on the number of pistils and stamens which a flower contains, plants are thrown together by it which have no natural analogy, and, indeed, no connection with each other, except in the eyes of a botanist; and the system of Jussieu is called the Natural System, because the plants thrown together by it agree not only in their parts of fructification, but in their general appearance, habits, and properties, and thus seem naturally allied even to those totally unacquainted with botany.

Both Linnæus and Jussieu, and indeed all other botanists, divide plants into classes, orders, genera, species, and varieties; and the chief points on which they disagree are, as to the nature and characteristics and the exact limits of their classes and orders.

CLASSES, ORDERS, GENERA, SPECIES, AND VARIETIES.

A *class* consists of a number of plants which resemble each other in some grand leading feature, but differ in minor particulars. The classes, according to the Natural System, being few, and each containing many plants, have been redivided into subclasses, which are afterwards divided into orders; but the Linnæan classes being numerous, and each containing only a few plants, are only redivided into orders.

An *order* consists of a number of plants that very closely resemble each other in some leading particulars; and, according to the Natural System, these points are so numerous that the plants belonging to most may be recognised at first sight: as, for example, any of the Crucíferæ, Umbellíferæ, or Leguminòsæ. Some of the natural orders that contain a great number of plants are again divided into sub-orders, sections, and tribes; the use of which is to show what plants are most nearly allied to each other.

A *genus* consists of plants very closely resembling each other, not only in the position and number of the organs of fructification, but in the form and general appearance of the flower, so that, even according to the Linnæan system, the plants can be recognised at first sight as belonging to each other. For example, roses differ very much from each other, yet all can be recognised at first sight as belonging to the same genus.

A *species* indicates the plants belonging to a genus which are distinguished by some marked peculiarities of form or construction, so as to be easily recognised: as, for example, Ròsa centifòlia, the cabbage rose, is a species of the genus Ròsa.

A *variety* indicates the individuals of a species which differ from each other in some not very important points, but yet some that can be easily distinguished; such as having double, or semi-double flowers, or the flowers being of a different colour to those of the species. The moss rose is a variety of the cabbage rose, and it is called by botanists Ròsa centifòlia var. muscòsa, or, as it is more commonly written, R. c. muscòsa. Sometimes where there are several varieties, they are indicated by figures, and at other times by the letters of the Greek alphabet; observing that the species is always reckoned for one, and that the varieties accordingly either begin with two, or with the Greek letter Beta.

Besides these, there are what are called *hybrids*, which are raised by fecundating the stigma of a plant of one species with the pollen of a plant of another species, or sometimes even of a nearly allied genus; and crossbreds, which are raised in the same manner, between two varieties of the same species—hybrids being generally described as species, and crossbreds as varieties.

THE LINNÆAN SYSTEM.

Linnæus arranged all plants in two great divisions, those having visible flowers, which he called *phænogamic*, and those having no visible flowers, which he called *cryptogamic*. The flowering plants he again divided into classes and orders, the classes depending in most cases on the number of the stamens, and the orders on the stigmas or ovaries. He made twenty-four classes, each of which was divided into several orders, and these were again divided into genera, species, and varieties.

TABLE OF THE LINNÆAN CLASSES AND ORDERS.

CLASSES.	ORDERS.
1. MONANDRIA, one stamen, has two orders.	1. *Monogynia*, with one ovary; and *Digynia*, two ovaries.
2. DIANDRIA, two stamens, has three orders.	2. *Monogynia*, *Digynia*, and *Trigynia*, three ovaries.
3. TRIANDRIA, three stamens, has three orders.	3. *Monogynia*, *Digynia*, and *Trigynia*.
4. TETRANDRIA, four stamens, has three orders.	4. *Monogynia*, *Digynia*, and *Tetragynia*, with four ovaries.
5. PENTANDRIA, five stamens, has six orders.	5. *Monogynia*, *Digynia*, *Trigynia*, *Tetragynia*, *Pentagynia*, with five ovaries; and *Polygynia*, with many ovaries.
6. HEXANDRIA, six stamens, has four orders.	6. *Monogynia*, *Digynia*, *Trigynia*, and *Polygynia*.
7. HEPTANDRIA, seven stamens, has four orders.	7. *Monogynia*, *Digynia*, *Tetragynia*, and *Heptagynia*, with seven ovaries.
8. OCTANDRIA, eight stamens, has four orders.	8. *Monogynia*, *Digynia*, *Trigynia*, and *Tetragynia*.

9. ENNEANDRIA, nine stamens, has three orders.	9. *Monogynia, Trigynia, Hexagynia*, with six ovaries.
10. DECANDRIA, ten stamens, has five orders.	10. *Monogynia, Digynia, Trigynia, Pentagynia*, and *Decagynia*, with ten ovaries.
11. DODECANDRIA, twelve stamens, has six orders.	11. *Monogynia, Digynia, Trigynia, Tetragynia, Pentagynia*, and *Dodecagynia*, with twelve ovaries.
12. ICOSANDRIA, with many, frequently twenty stamens, attached to the calyx. This class contains three orders.	12. *Monogynia, Di-pentagynia*, varying from two to five ovaries; and *Polygynia*.
13. POLYANDRIA, many stamens, not attached to the calyx. This class contains five orders.	13. *Monogynia, Digynia, Trigynia, Pentagynia*, and *Polygynia*.

All the above classes have their stamens of equal length.

14. DIDYNAMIA, four stamens, two of which are long, and two short. This class contains two orders.	14. *Gymnosperma*, with naked seeds; and *Angiospermæ*, with the seeds inclosed in a seed vessel.
15. TETRADYNAMIA, six stamens, four of which are long, and two short. This class contains two orders.	15. *Siliculosa*, with the seeds inclosed in a silicle; and *Siliquosa*, with the seeds inclosed in a silique.

All the above classes have their stamens free and distinct.

16. MONADELPHIA, in which the stamens are all united into one column or bundle. This class was divided by Linnæus into seven orders, founded on the number of the stamens contained in each, and not like the other orders, on the ovaries.	16. *Triandria* has three united stamens; *Pentandria* has five; *Heptandria*, seven; *Octandria*, eight; *Decandria*, ten; *Dodecandria*, twelve; and *Polyandria*, many.
17. DIADELPHIA, having the stamens in two bundles. Four orders.	17. *Pentandria*, *Hexandria*, *Octandria*, and *Decandria.*
18. POLYADELPHIA, having the stamens in many bundles. Four orders.	18. *Decandria*, *Dodecandria*, *Icosandria*, many stamens, attached to the calyx; and *Polyandria*, many stamens, not attached to the calyx.

In the above orders, the stamens are united by their filaments.

19. SYNGENESIA, having the stamens united by their anthers into a cylinder. In this class there are five orders, all of which are called Polygamia, because each flower contains many florets on one common receptacle, like the daisy. Linnæus added another order, called	19. *Æqualis*, in which the florets are all bisexual, that is, all have both stamens and pistils; *Superflua*, in which the florets of the disk are bisexual, but those of the ray have only pistils; *Frustranea*, in which the florets of the disk are bisexual, and those of the ray without

Monogamia, which had the anthers united in simple flowers, as in the case of the violet; but this is now abandoned.	either stamens or pistils; *Necessaria*, in which the florets of the disk have only stamens, and those of the ray only pistils; and *Segregata*, in which every floret has a separate calyx.
20. GYNANDRIA, having the stamens growing upon the pistil. Three orders.	20. *Monandria, Diandria,* and *Hexandria.*

In all the above classes, the stamens and pistils are found in the same flowers.

21. MONŒCIA, having the stamens and pistils in different flowers, but on the same plant. There are eight orders in this class.	21. *Monandria, Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Polyandria,* and *Monadelphia.*
22. DIŒCIA, having the stamens and pistils, not only in different flowers, but on different plants. There are fourteen orders in this class.	22. *Monandria, Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Octandria, Enneandria, Decandria, Dodecandria, Icosandria, Polyandria, Monadelphia,* and *Gynandria.*
23. POLYGAMIA, having the flowers sometimes bisexual, and sometimes male and female on the same or on different plants. Two orders.	23. *Monœcia* and *Diœcia.*

All the above classes have visible flowers.

24. CRYPTOGAMIA, or flowerless plants, containing nine orders.	24. *Fílices* (ferns); *Equisetàceæ* (Dutch rush, and common horsetail); *Lycopodíneæ* (club mosses); *Marsileàceæ* (pepperworts); *Músci* (mosses); *Hepáticæ* (liverworts); *Álgæ* (seaweeds); *Lichènes* (lichens); and *Fúngi* (mushrooms, &c.).

All these classes and orders are subdivided into genera, species, and varieties.

THE SYSTEM OF JUSSIEU.

Jussieu divided all plants into three great classes, viz.:—

ACOTYLEDONS, or plants without any cotyledon or seed leaf, in which he included the ferns and mosses.

MONOCOTYLEDONS, or plants with only one seed leaf, in which he included the grasses, the bulbous plants, and, in short, all that have the veins of their leaves in parallel lines.

DICOTYLEDONS, or plants with two seed leaves, which have leaves with reticulated veins.

The acotyledonous plants being few in number, were not subdivided, except into genera and species; but the monocotyledonous plants were redivided into three subclasses, according as the stamens were *hypogynous, perigynous*, or *epigynous* (see pp. 22, 23). The dicotyledonous plants Jussieu divided into the *apetalous*, the *monopetalous*, and the *polypetalous;* and each of these were again divided into subclasses, depending on the position of the stamens with regard to the ovary, and on their being united or distinct. Jussieu having thus made fifteen classes and subclasses, proceeded to the arrangement of the orders, of which he made one hundred, which he divided among his classes, beginning with the fungi, as being the lowest in his scale of rank in the vegetable kingdom, and proceeding upwards to the coniferæ, which he placed last, as being, what he considered, the highest in the scale.

THE NATURAL SYSTEM, AS MODIFIED BY PROFESSOR DE CANDOLLE.

When the late Professor De Candolle undertook the arrangement of the system of Jussieu, he first changed the succession of the orders; and instead of beginning with the ferns and mosses, he began with the most perfect of the dicotyledonous plants; viz., those possessing both a calyx and a corolla. According to this arrangement he made Ranunculàceæ, or the crowfoot family, his first order, and the Álgæ, or sea-weeds, his last. De Candolle retained the three great divisions of Jussieu, but gave up the subdivisions; and substituting others for them, he redivided the dicotyledonous plants into two subdivisions, viz., the Dichlamýdeæ, or those which have both a calyx and a corolla, and the Monochlamýdeæ, or those which have only a calyx. The dichlamýdeæ De Candolle again divided into the thalamiflòræ, which have the stamens growing from the receptacle from under the ovary (see fig. 42, in page 22); the calyciflòræ, which have the stamens attached to the calyx (see fig. 43, in page 23); and the corolliflòræ, which have the stamens attached to the corolla (see fig. 44, in page 23). The first two of these last subdivisions have polypetalous flowers, but the flowers of the last are monopetalous.

The monocotyledons De Candolle subdivided into the Petaloid plants, or those with regular flowers, such as the bulbs and the orchids; and the Glumaceous plants, or those with scales or glumes instead of petals, as the sedges and the grasses. The acotyledons he subdivided into the *foliaceous*, or those with leaves, such as the ferns and the mosses; and the *aphyllous*, or those without leaves, such as the seaweeds, the lichens, and the fungi.

Since the promulgation of this system, however, several alterations have been made in it by adding new orders and dividing others, and altering the places of many, by different botanists, and especially by the late Dr. Lindley, in his work entitled "The Vegetable Kingdom." The arrangement of De Candolle, however, is the one still most commonly followed; and it is the only one for which room can be found in this work.

INTRODUCTION TO THE NATURAL SYSTEM OF DE CANDOLLE.

FIRST GRAND DIVISION, VASCULÀRES (*vas*, a vessel; plants with spiral vessels, woody fibre, and cellular tissue), or COTYLEDÒNEÆ.

First Class, DICOTYLEDÒNEÆ (*dis*, two, and *kotyledon*; cotyledons, two).

Subdivision I. *Dichlamýdeæ* (*dis*, two, and *chlamys*, a coat, or covering; calyx and corolla distinct).

Subclass 1. Thalamiflòræ (*thalamus*, a bed, or receptacle, and *flos*, a flower; stamens under the pistil).—Order 1. Ranunculàceæ to 58. Coriarièæ.

Subclass 2. Calyciflòræ (*calyx* and *flos*; stamens on the calyx). — Order 59. Celastríneæ, to 116. Peneàceæ.

Subclass 3. Corolliflòræ (*corolla* and *flos*; stamens on the corolla).—Order 117. Epacrídeæ, to 150. Plumbagíneæ.

Subdivision II. *Monochlamýdeæ* (*monos*, one, and *chlamys*, a coat, or covering; calyx and corolla not distinct). — Order 151. Plantagíneæ, to 177. Empétreæ.

Second Class, MONOCOTYLEDÒNEÆ (*monos*, one, and *kotyledon*; cotyledon, one). — Order 178. Cycàdeæ, to 210. Gramíneæ.

SECOND GRAND DIVISION, CELLULÀRES (*cellula*, a little cell; plants with cellular tissue only), or ACOTYLEDÒNEÆ (*a*, without, and *kotyledon*).

First Class, FOLIÀCEÆ (*foliaceus*, leafy; habit).—Order 211. Fílices, to 216. Hepáticæ.

Second Class, APHÝLLÆ (*a*, without, and *phyllon*, a leaf; leafless).—Order 217. Álgæ; 218. Lichènes; and 219. Fúngi.

By the foregoing tabular view it will be seen that, according to the arrangement of De Candolle, plants are separated into two grand divisions, viz., the Vasculàres and the Cellulàres.

Fig. 79.—Beech-Tree;—an Exogen.

The Vasculàres (Phænogamous, Phanerogamous, or Cotyledonous plants) are again separated into two great classes called Exogens or Dicotyledons (of which the beech, fig. 79, is given as an example), and Endogens or Monocotyledons (for two examples of which see fig. 80). They are all formed of cellular tissue, woody fibre, and spiral vessels; their leaves are traversed by veins; and they bear visible flowers. In Exogens or Dicotyledons the bark and wood are

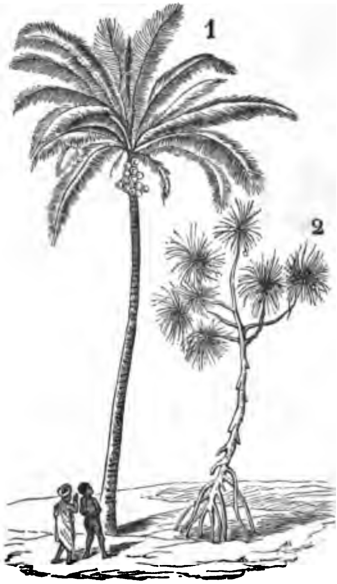


Fig. 80.—Two Monocotyledonous trees belonging to two different families: 1. Cocoa-nut-tree (*Còcos nucífera*); 2. *Pandànus odoratíssimus.*

distinctly separated (see fig. 81); but in Endogens or

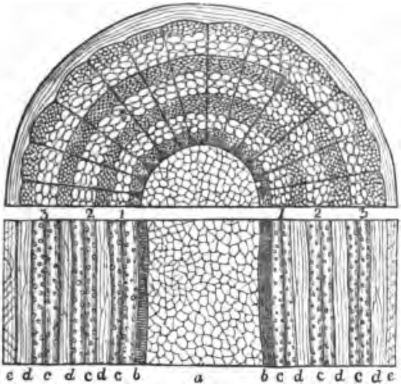


Fig. 81.—Horizontal or transverse, and perpendicular sections of the stem of an Exogen or Dicotyledon of three years' growth. In the centre of each is seen the pith, *a*, composed of cellular tissue; surrounding it is the medullary sheath, *b*; and exterior to it are three rings of wood, each consisting of *c*, *c*, dotted ducts, and *d*, *d*, woody fibre. The last-formed is in contact with the bark, *e*, *e*, in which the layers are indistinct.

Monocotyledons there is no distinction between the wood and the bark (see fig. 82). In Dicotyledons the wood and cellular tissue have each their particular limits assigned them, a distinct layer of wood being annually deposited and easily distinguishable. In Monocotyledons the wood and cellular tissue are mixed together, without any distinct annual layers of wood being evident. In Dicotyledons the radiations from the medulla (pith) to the bark are distinctly marked, while in the Monocotyledons there are no such radiations. In Dicotyledons the leaves are always jointed with the stem, from which they fall off, leaving a scar behind; but in Monocotyledons there is generally no articulation between the leaves and the stem.

In Dicotyledons the veins of the leaf (see fig. 83) diverge from the midrib towards the margin at various angles, being much branched in many directions, and giving the surface of the leaf a netted appearance;

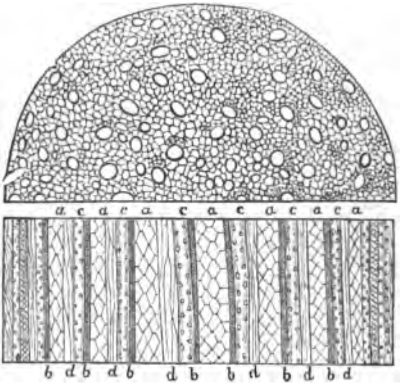


Fig. 82.—Horizontal and vertical sections of the stem of an Endogen or Monocotyledon, showing the bundles of ducts, woody fibre, and spiral vessels, irregularly disposed through the whole stem. *a, a,* portions of cellular tissue; *b, b,* spiral vessels; *c, c* dotted ducts; *d, d,* woody fibre.

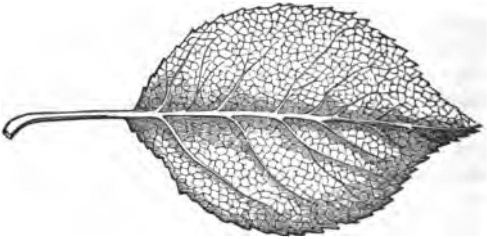


Fig. 83.—An Exogenous or Dicotyledonous Leaf.

but in the Monocotyledons the veins of the leaf (see fig. 84) pass in parallel lines from the base to the apex,

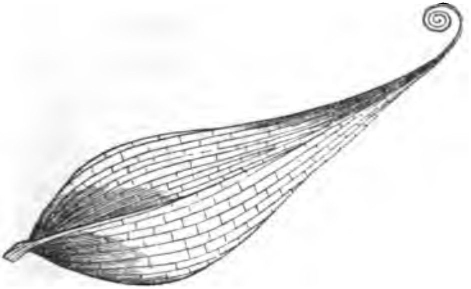


Fig. 84.—An Endogenous or Monocotyledonous Leaf.

and they are not branched, the principal veins being connected by many simple secondary veins.

The Cellulàres (Cryptogamous, or Acotyledonous plants) are also divided into two classes, the first containing those with leaves (as an example of which a tree-fern is shown in fig. 85), as the ferns and mosses; and the second those without leaves, as the algæ, lichens, and fungi. Cellular plants are formed entirely of cellular tissue, without spiral vessels; they have no veins in their leaves, if foliaceous; they do not form wood; and they are destitute of perfect flowers. In the highest tribe, ferns, apparent veins are formed in the leaves or fronds, but they are not supplied with spiral vessels. The lower tribes, such as algæ and fungi, are destitute of leaves.

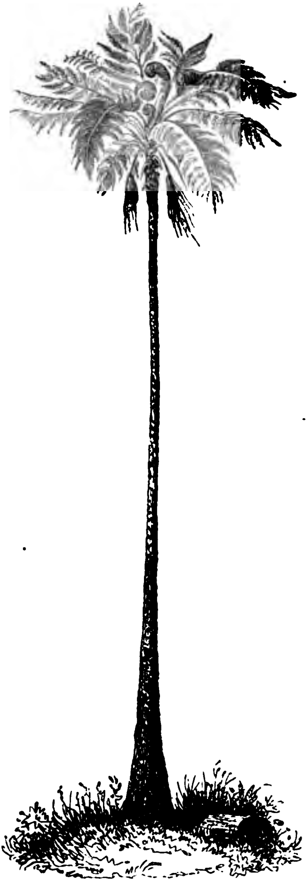


Fig. 85.—A Tree-Fern (*Alsóphila Perrotetiàna*), a native of the East Indies.

THE ARRANGEMENT OF THE NATURAL ORDERS.

FIRST GRAND DIVISION.—VASCULÀRES.

Class 1.—DICOTYLEDÒNEÆ, or Exógenæ (*exo*, outside, *geinomai*, to grow).

Subdivision 1.—DICHLAMÝDEÆ.

In this subdivision are included all the Dicotyledonous plants that have two floral envelopes, *i.e.*, a calyx and a corolla, by which they are distinguished from the *Monochlamýdeæ*, or those having only a calyx.

Subclass 1.—THALAMIFLÒRÆ.

Petals and stamens inserted into the receptacle.

The insertion of the petals and stamens into the receptacle is the great distinguishing characteristic of this subclass.

Section 1.—*Carpels numerous, or Stamens opposite the petals.*

Order 1. RANUNCULÀCEÆ.—THE CROWFOOT FAMILY.

The plants of this order are known by their numerous stamens, the anthers of which burst outwardly; by their carpels growing close together without adhering, except in one or two instances; and by the stem-clasping petioles of their leaves, which are generally deeply cut. The flowers have five petals and five sepals, differing, however, widely in shape, the calyx of several of them being coloured so as to resemble a corolla. In this order we have the graceful Clématis, the lowly Anemòne, the glittering Ranúnculus, and the gaudy Pæony; and it may be remarked, that the acrid and poisonous properties of these plants are nearly as powerful as their beauty is great. They are all caustic, and in many of them the deleterious principle is in dangerous abundance. M. De Candolle says that its nature is extremely singular: it is so volatile, that, in most cases, simple drying in the air or infusion in water is sufficient to destroy it. It is neither acid nor alkaline, but its activity is increased by acids, honey, sugar, wine, or alcohol; and it is, in reality, destructible only by water. The geographical range of this order is very extensive. A large number has been discovered in Europe, but so abundant are the plants in all parts of the world, that an order can scarcely be found more universally and equally dispersed. The genus *Ranúnculus* is the type of this order.

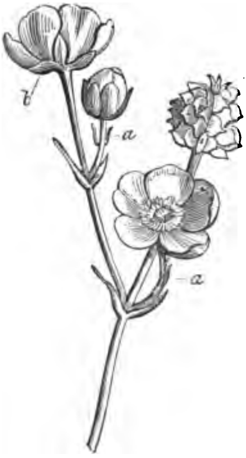


Fig. 86.—Flower-stalk of Meadow Crowfoot; on the right, an open flower and dry fruit; on the left, expanding buds; *a*, *a*, bracts; *b*, calyx.

There are more than a dozen British species of Ranúnculus. Two of these (see figs. 86 and 87) are known by the popular names of Butter flower and Buttercup; viz., the Upright Meadow Crowfoot (*R. àcris*) and the Bulbous Crowfoot (*R. bulbòsus*). These popular names were given to the plants under the idea that the deeper colour of butter made during their flowering season is derived from the cows feeding on their brilliant yellow flowers; but their acridity is generally so great, that neither cows nor horses will eat them, however bare the pastures may be of other and more grateful herbage.

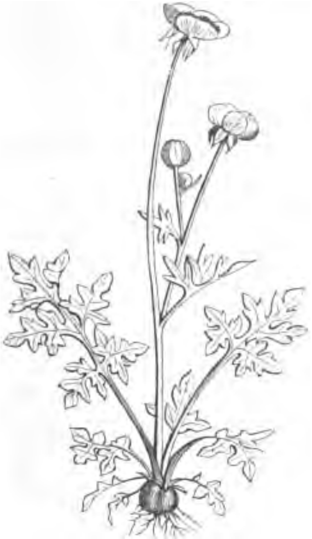


Fig. 87.—*Ranúnculus bulbòsus.*

Order 2. DILLENIÀCEÆ.

The fine plants composing this order are almost entirely confined to tropical countries. They resemble the *Ranunculàceæ* in having five petals, five sepals, and numerous stamens; but the anthers burst inwardly instead of outwardly; there are never more than five carpels, and seldom more than two, which often grow into a berry-like fruit, as in the genus *Dillènia,* which is the type of the order. The medical properties of the plants composing this order are scarcely known: a decoction of the leaves or bark is astringent, and used for gargles; and the acid juice of the fruit of some of the species of Dillènia is used in India, mixed with water, as a pleasant beverage in cases of fever.

Order 3. MAGNOLIÀCEÆ.—THE MAGNOLIA FAMILY.

The fruit of the *Magnoliàceæ* consists of a number of carpels arranged so as to form a cone. Of the genera contained in the order, the two best known are *Magnòlia* and *Liriodéndron* (the Tulip-tree). Most of the species of the genus Magnòlia are well known from the beauty and grandeur of their flowers and their delicious, though sometimes dangerous, fragrance; but it is less generally known that they are nearly allied to the trees producing the celebrated Winter's bark and Melambo bark, and that they possess important medicinal qualities. The bark of all of them is said to have a bitter flavour, without any astringency, combined with a hot aromatic principle.

In the United States, the bark of *Magnòlia glaúca* and *Liriodéndron tulipífera* is employed for the same purposes as Jesuit's bark; and from the fruit of *Magnòlia acuminàta* a tincture is prepared which is said to be efficacious in removing attacks of rheumatism. The fruit of *Illícium anisàtum* is used to flavour the liqueur called *Anisette de Bourdeaux.* The Magnolias are inhabitants of Asia and America.

Order 4. ANONÀCEÆ.—THE CUSTARD-APPLE FAMILY.

The plants of this order are chiefly distinguished from the Magnoliàceæ by the absence of stipules, and by the structure of their anthers and seeds. The latter consist of a hard mass of albumen, perforated by the substance of the seed-coat in every direction. All the plants of the order are aromatic trees or shrubs, chiefly inhabitants of the hottest parts of the tropics, though a few have been found in the temperate zones of America. The fruit of *Anòna muricàta,* called the Custard Apple, or Sour Sop, in the West Indies, is highly esteemed for the dessert; and that of *A. Cherimòlia* (a native of Peru), called the Cherimoyer, has the reputation of being the finest fruit in the world, next to the Mangosteen. Another species (*A. squamòsa*) is called the Sweet Sop (see fig. 88).

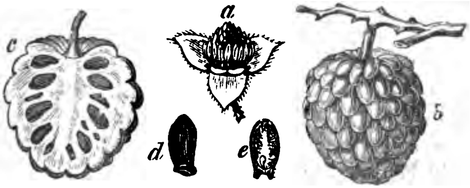


Fig. 88.—Anòna squamòsa, or Custard-Apple: *a*, the flower; *b*, fruit; *c*, the same in section, showing the position of the seeds; *d*, seed; *e*, section of the seed.

Order 5. MENISPERMÀCEÆ.—THE MOON-SEED FAMILY.

This order consists of climbing exotic shrubs, with racemes of small flowers. They all differ greatly in habit from the orders which are placed near them.

The male and female flowers are on different plants. The number of sepals and petals varies in the different genera, and sometimes the petals are wanting. The stamens frequently grow together into a central column; and the fruit is a drupe, or one-seeded berry, generally scarlet, but sometimes black. The Canadian Moon-Seed (*Menispérmum canadénse*) is an ornamental, hardy, climbing shrub. The famous Calumba root, so much esteemed as a tonic drug, is the root of *Cócculus palmàtus;* and the poisonous drug called Cocculus indicus in the shops is the fruit of *Anamírta Cócculus.*

Order 6. BERBERÍDEÆ.—THE BERBERRY FAMILY.

The genus *Bérberis* is the type of this order. The flower of the common Berberry (*B. vulgàris*) has on the outside three little bracteal scales, which are reddish on the back, and soon fall off. The corolla has six petals and the calyx has six sepals; but these divisions being all of the same size and shape, and of similar colour and texture, it is not very easy to distinguish at a glance the calyx from the corolla. On examination, however, each petal will be found to have two little glands at its base, while the sepals have not these glands. The sepals being placed exactly behind the petals, the one appears a lining of the other; and the petals, being concave, serve as a kind of cradle to the stamens. There are six stamens, having broad filaments; and, instead of anthers, the filaments are widened at the tip, each containing two cases for the pollen, and these cases are furnished with a valve-like lid, which opens and curls back when the pollen is ripe. The pistil is pitcher-shaped, with a very thick style and a flat stigma. It stands erect, the stamens being spread out at some distance from it; but the stamens are so irritable that the slightest touch makes them spring forward and discharge their pollen on the stigma, afterwards falling back into their former places. The flowers, which are yellow, are produced in long, graceful, drooping racemes, and they are succeeded by red oblong berries, each containing two seeds. The common Berberry is a deciduous shrub, with tufts of simple leaves, each leaf being delicately fringed with hair-like teeth. Each tuft of leaves has two or three sharply-pointed stipules, easily distinguished from the leaves by their margins being without teeth; and below these are three spines, which, when young, are soft, and look like folded leaves, but which, when older, become hard and sharply-pointed. By some botanists these spines are considered to be abortive branches. An illustration is given of the Siberian Berberry (see fig. 89, *b*). All the species of Bérberis and Mahònia

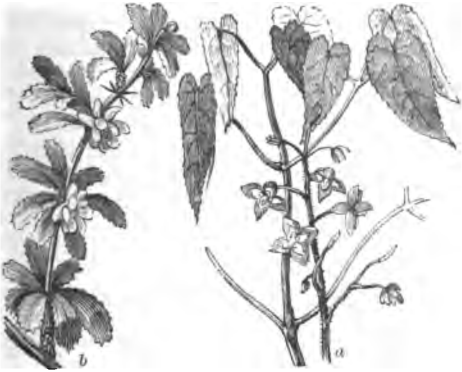


Fig. 89.—Epimèdium alpìnum, and Bérberis sibírica.

(the Ash-leaved Berberry) are shrubs of much beauty and interest. They are mostly inhabitants either of Europe, Asia, or North and South America. Many fine species from Chili and India yet remain to be introduced. The fruit of the Berberries is acid and astringent; the latter quality is most abundant in the stem and bark.

The Barren-wort (*Epimèdium alpìnum*), a little elegant British plant (fig. 89, *a*), also belongs to this order.

Order 7. PODOPHYLLÀCEÆ.—THE MAY-APPLE FAMILY.

This order consists of interesting herbaceous North American plants, nearly related to *Nymphæàceæ* on the one hand, and on the other to the herbaceous genera of *Berberídeæ*. The genus *Podophýllum* (the type of the order) has numerous stamens, and a fleshy berry with only one cell, which does not open when ripe. From the root of the May-apple (*Podophýllum peltàtum*) Podóphylline is prepared. The fruit of the May-apple is eatable when ripe, but it is very acid. The leaves are very large, and, as the specific name implies, peltate—that is, with the footstalk attached to the centre of the leaf.

Order 8. HYDROPELTÍDEÆ.

There are very few plants in this order. They are aquatics from tropical and northern America, differing from the Nymphæàceæ chiefly in having a definite number of seeds. *Hydropéltis purpùrea*, the type of the order, is a hardy water-plant, with peltate leaves, and dull purple flowers.

Order 9. NYMPHÆÀCEÆ.—THE WATER-LILY FAMILY.

The Nymphæàceæ are all aquatic plants, of great interest and beauty. There are three Water Lilies common to our own streams and ponds, viz., the common White Water Lily (*Nymphæa álba*), the common Yellow (*Nùphar lùtea*), and the pigmy Yellow (*Nùphar mínima*). The flowers of the common White Water Lily consist of numerous sepals, petals, and stamens: the sepals are green on the outside, but white within, and of the same fleshy substance as the petals; the stamens look like narrow yellow petals, they are pointed, and bear the pollen in two lobes, near the point, which open longitudinally when ripe. The pistil consists generally of sixteen carpels, growing together into a vase-like many-celled berry; the spreading stigmas, also growing together, forming a kind of lid. The carpels are completely enclosed by the receptacle rising up round them, and forming a thick fleshy covering. The seeds are numerous, and are covered with a thick leathery skin. The embryo is small, and surrounded by a great mass of floury albumen. The leaves are large and somewhat heart-shaped. The main root, which is called a rhizoma, is thick and fleshy; it is, indeed, an underground stem. There are several exotic species of *Nymphæa.* Some of the Indian kinds are delightfully fragrant. Of the Egyptian Lotus (*N. Lòtus*), the flowers of which are white tinged with pink, both the roots and seeds are eaten. The common Yellow Water Lily has a cup-shaped calyx of five large yellow sepals, the tips of which curve inwards. The petals are small, truncate, and flat, with a small pore on the back of each; and the stamens, which are very numerous, have broad petal-like filaments, differing very much in appearance from those of the White Water Lily, being differently placed, and springing from the base of the vase-like pistil, and not from the upper part. There are from sixteen to twenty carpels, enclosed in the dilated receptacle, to which the stigmas form a ray-like cover; and each carpel contains several seeds. This Water Lily is very common in ponds and streams in many parts of England. It is sometimes called Brandy-bottle, from the smell of the flowers. In Sweden, in years of scarcity, the roots are pounded into cakes, along with the inner bark of *Pìnus sylvéstris.* The exotic species of Nùphar are mostly natives of North America. The Indian Lotus, or Sacred Bean of India (*Nelúmbium speciòsum*), by some supposed to be the Holy Cyamus, or Pythagorean bean of antiquity, is a stately aquatic, abounding in all the hotter countries of the East, where its roots are frequently used as an article of food. The beans are oblong, hard, and smooth, and possess the power of vegetating after having been dried for even thirty years. They have a sweet milky flavour, and are good to eat. The most striking and magnificent plant in the order, however, is undoubtedly the Royal Water Lily, *Victòria règia* (a native of South America), which has been very successfully cultivated at Chatsworth, Sion, Kew, the Royal Botanic Gardens in the Regent's Park, and other places in this country. The leaves of this gigantic Water Lily are sometimes from five to seven feet in diameter, and twenty feet or more in circumference, very prickly, and turned up at the rim all round; the under side is purple, with very strong ribs and veins radiating from the petiole till they disappear at the edge. The flowers measure more than a foot in diameter; they are very fragrant, and expand in the evening about six o'clock: the outer petals are white, the inner ones gradually becoming of a deep rose-colour. To grow this fine plant a large aquarium is required.

Order 10. SARRACENIÈÆ.—THE SIDE-SADDLE-FLOWER FAMILY.

This order, of which the genus Sarracènia is the type, contains plants remarkable for the singular form of their leaves, which are tubular, and hold water, some species having lids or covers, which, it is said, shrink and close over the mouth of the tube in dry weather, to prevent the evaporation of the water. The order is chiefly distinguished from Nymphæàceæ and Papaveràceæ in having a broad peltate leafy stigma. The plants inhabit the swamps of North America.

Section 2.—*Carpels solitary, or joined together; Placentæ parietal.*

Order 11. PAPAVERÀCEÆ.—THE POPPY FAMILY.

Some of the plants contained in this order are common weeds, and the pests of cornfields. They nearly all possess medicinal properties. From the Opium Poppy (*Papàver somníferum*) the drug opium is obtained. The Canadian Blood-wort, or Puccoon (*Sanguinària canadénsis*), a little North American plant, common in our gardens, has crimson juice, and its roots possess emetic and purgative powers. From the seeds of the Prickly Poppy (*Argemòne mexicàna*) the Mexicans express oil. The pretty delicate little Violet Horned-Poppy (*Röměria hýbrida*) is one of our rare British plants, being found only in cornfields in Norfolk and Cambridgeshire, and even in those counties not very frequently.

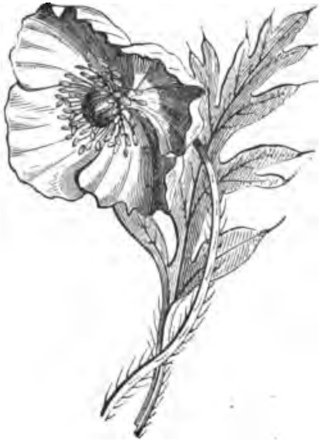


Fig. 90.—Leaf and Flower of the Naked-stalked Poppy (*Papàver nudicaùle*), exhibiting the four petals, numerous stamens, and single ovary.

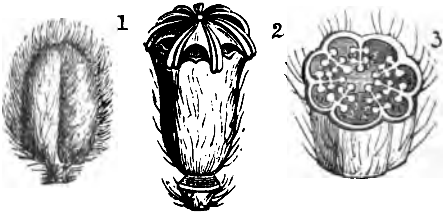


Fig. 91.—Parts of the Flower enlarged; 1, a flower-bud, showing the two sepals which enclose it; 2, the ovary with its radiating stigmas; 3, the ovary cut open.

Order 12. FUMARIÀCEÆ.—THE FUMITORY FAMILY.

The plants now included in this order were formerly combined with Papaveràceæ. They have rather a smoky smell, and when broken yield a watery juice, without any appearance of milkiness. They have very trifling medicinal properties. The principal genera are Diélytra, Fumària, and Corydàlis. The *Diélytra spectábilis* is one of the most graceful and beautiful plants of the order.

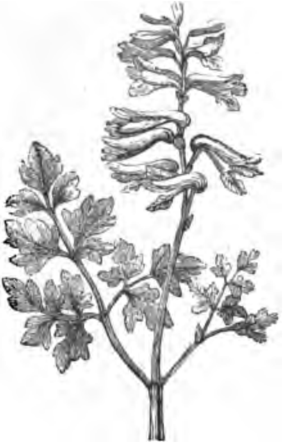


Fig. 92.—Fumària lùtea.

Order 13. CRUCÍFERÆ (*crux*, a cross, *fero*, to bear; form of corolla).—THE CRUCIFEROUS FAMILY.

The great importance of the plants of this order to mankind can hardly be overstated, containing as it does the turnip, the rape, the cabbage and its numerous varieties, the radish, and many other most useful plants. The flowers of Cruciferous plants have four divisions to the calyx and the corolla, the four sepals being placed alternately with the four petals, the latter forming a cross, and hence the name of Cruciferous (cross-bearing). There are six stamens, two of which are shorter than the others;

two carpels, one style, and a divided stigma. The seed-vessel is a kind of pod, either short and broad, like that of the Shepherd's Purse, when it is called a silicle, or long and narrow, like that of the Cabbage, when it is called a silique. The two valves of the silique open naturally when ripe, curving upwards, and the seeds are deposited on a thin membrane (called the dissepiment) between the cells. The greater part of the plants of the order possess high anti-scorbutic properties, particularly the mustard, the horse-radish, the scurvy-grass, the common radish, and the different kinds of cress. It may be remarked that cruciferous plants are always eatable when their texture is succulent and watery, as in the

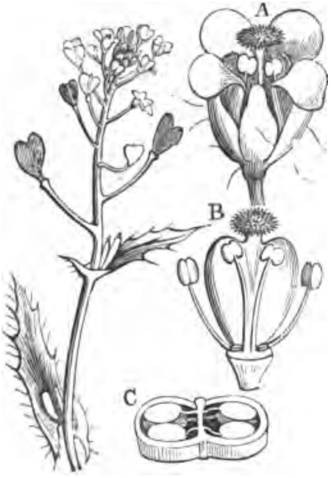


Fig. 93.—Shepherd's Purse (*Capsélla Búrsa Pastòris*) ; A, whole flower enlarged ; B, stamens and pistil ; C, horizontal section of ovarium.

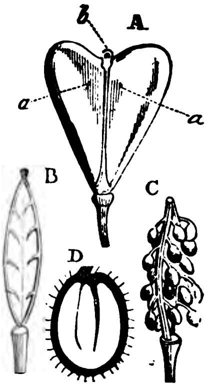


Fig. 94.—A, ripe fruit *a*, *a*, the valves ; *b*, the dissepiment. B, dissepiment seen in front, with the marks of the places to which the seeds are attached ; C, dissepiment with seeds attached ; D, section of seed.

roots of the turnip, the radish, and the leaves of the cabbage tribe. From the seeds of some of the plants oil is expressed, and used either for culinary purposes or for burning in lamps. Some of the species are extremely beautiful and delightfully fragrant, as the stocks, the wallflowers, the candytufts, and many others.

Order 14. RESEDÀCEÆ.—THE MIGNONETTE FAMILY.

The only plant of interest in this order is the well-known and much-prized Mignonette (*Resèda odoràta*), a native of Egypt. Another species (*R. Lutèola*), a British plant, called Dyer's Weed, or Weld, yields a yellow colour used in dyeing.

Order 15. DATÍSCEÆ.

There are very few plants contained in this order. They are chiefly coarse-growing, hardy perennials, having the appearance of hemp, and are natives of the South of Europe, Nepal, and North America.

Order 16. CAPPARÍDEÆ.—THE CAPER FAMILY.

The plants in this order possess the properties of the *Crucíferæ.* Many of them are very pretty, especially *Cleòme ròsea.* The common Caper (*Cápparis spinòsa*) is an elegant spiny shrub, with large white flowers and long purple stamens, which are very numerous. The unexpanded flower-buds are pickled. The different kinds of Cápparis have the reputation of being stimulating, antiscorbutic, and aperient. The bark of the root of the common caper is sometimes used in medicine. Several species of Cleòme have an acrid taste, similar to that of mustard.

Order 17. FLACOURTIÀNEÆ.

This order consists of small tropical trees or shrubs. In Madagascar the berries of *Flacoúrtia Ramóntchi* are eaten; and of the fruit of one species of the genus a preserve is made in the West Indies.

Order 18. BIXÍNEÆ.

The few plants in this order are not remarkable for their beauty. They are shrubs or small trees, mostly tropical. The *Bíxa Orellàna* is a South American shrub, with pink flowers, which have five sepals to the calyx and five petals to the corolla, the stamens being numerous. The leaves are very large, and heart-shaped. The fruit is a berry, and the pulp in which the seeds are immersed when dry is sold in the shops under the name of Arnotto (*Rocoñ*, Fr.), and used for colouring cheese, and for other purposes. The Azaras, Chilian shrubs with fragrant flowers, are as yet not much known in the gardens of Europe.

Order 19. CISTÍNEÆ.—THE ROCK-ROSE FAMILY.

The common rock-roses and sun-roses of our gardens are the most striking plants in this order. They are found in most parts of the world, growing in dry, elevated, rocky places. They are all very ornamental, and very suitable for covering rock-work. The flowers of all the species of *Cístus* (Rock-rose) and *Heliánthemum* (Sun-rose) have five petals, which are crumpled up in the bud like those of the poppy. The calyx generally consists of five sepals, two of which are larger, and of a paler green than the others, and grow a little below them: in the

Gum-Cistus the two outer sepals are wanting. The petals fall very soon after the flower opens, but the calyx remains on till the seed is ripe. There are a great many rather short stamens, forming a tuft in the centre of the flower, and surrounding the pistil, which has a round, flat-headed stigma, a rather long style, and a five-celled ovary. The gum called laudanum, or labdanum, which is used in medicine, is the produce of several kinds of Cístus: it possesses tonic and stomachic properties, and when burnt it exhales a fragrant perfume.

Order 20. VIOLARIÈÆ.—THE VIOLET FAMILY.

This order is composed for the most part of hardy herbaceous plants, some of which are remarkable for their fragrance, others for their brilliant colours, and all for their neatness. They are natives of the temperate or cold zones of both hemispheres, often growing at great elevations above the sea. The Sweet Violet (*Vìola odoràta*) and the Heart's-ease (*V. trícolor*) are known by every one, and general favourites. The medical properties of the plants in this order are found chiefly in their roots: they are, in a greater or less degree, emetic. One kind of Ipecacuanha is obtained from the root of a Brazilian violet.

Order 21. DROSERÀCEÆ.—THE SUN-DEW FAMILY.

The sundews are natives of marshes or inundated grounds in most of the temperate parts of the world. They are remarkable for the abundance of glandular hairs with which all the parts of the foliage are covered. The three genera of the order best known are: *Drósera, Dionǽa,* and *Parnássia.* There are three British species of Drósera, and other species are natives of New Holland, North America, and the Cape of Good Hope. All the species are remarkable for the curious manner in which the leaves and peduncles are coiled up when they first appear, and in which they slowly unroll as they grow. The leaves are also beautifully fringed with glandular red hairs; and, as a fluid exudes from these glands, they always appear as if covered with dew. The leaves of Venus's Fly-trap (*Dionæa muscípula*), a North American plant, are curiously formed of two lobes, which close and open as if hinged, and they are furnished with glandular hairs so extremely irritable as to make the leaves close at the slightest touch, and thus securing any insect that may be within the lobes. The petiole is so much dilated as to look like a leaf, but the real leaf consists of only

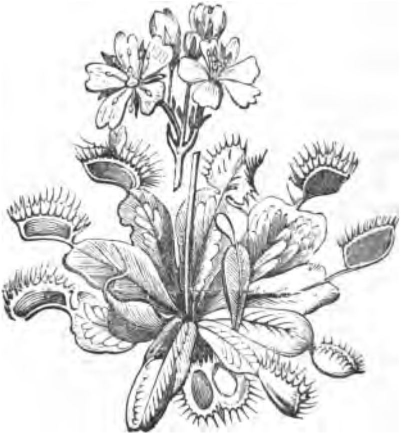


Fig. 95.—Dionæa muscípula.

the two roundish lobes, edged with hairs, that form the fly-trap. The flowers are white, and are produced in corymbs. The corolla has five petals, which do not fall off when they wither, but roll up, and look like the cocoon of an insect.—The grass of Parnassus (*Parnássia palústris*) is one of the most elegant of our British marsh plants, producing its delicate white flowers in July and August.

Order 22. POLYGÀLEÆ.—THE MILKWORT FAMILY.

Of this order some are low-growing herbaceous plants, and others are graceful shrubs, found in various parts of the world: some are remarkable for their beauty and some are useful in medicine. In the flowers of the Polygàleæ, which are generally keel-shaped and beautifully crested or bearded, the stamens are united into a single body, the anthers being one-celled and opening by a pore at the apex. The leaves have generally a bitter astringent taste (which is much more abundant in the roots), combined with an acrid and resinous flavour, these properties being particularly discernible in *Polýgala Sénega* (the Rattlesnake root), a species which is reputed to be of great use medicinally. The beautiful little *Polýgala vulgàris* (the Common Milkwort), a British plant, is said to possess some of the properties of *P. Sénega*.

Order 23. TREMÁNDREÆ.

A small order containing pretty slender New Holland shrubs, which resemble heaths.

Order 24. PITTOSPÒREÆ.

The shrubs or small trees forming this order (chiefly natives of New Holland and the African islands), have simple alternate leaves without stipules, and the sepals and petals, each five in number, are imbricated, that is, laid over each other like the scales of a bud. The stamens are also five in number. The seeds are numerous, and immersed in fibrous pulp.

Order 25. FRANKENIÀCEÆ.

The plants in this order have little beauty. They are natives of arid situations in Europe, Africa, and South America.

Section 3. *Ovary solitary. Placenta central.*

Order 26. CARYOPHÝLLEÆ.—THE CARNATION FAMILY.

The pinks and carnations are easily recognised, distinguished as they are by the swollen joints of their stems, and by their opposite undivided leaves, which are generally united at the base and sheathe the stem. These and the sweetwilliams, which are contained in the genus *Diánthus*, are some of the most striking plants in the order, remarkable for the brilliancy and fragrance of their flowers. Other well-known genera are: Saponària (the Soapwort), Silène (the Catchfly), Cucùbalus (the berry-bearing

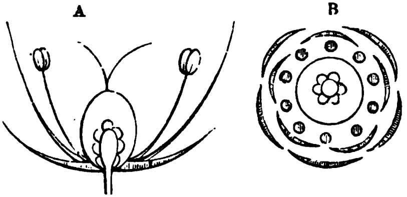


Fig. 96.—Diagram of the flower of Caryophýlleæ.
A, vertical section. B, horizontal section.

Campion), Stellària (the Stitchwort), Arenària (the Sandwort), Lýchnis, Cerástium, and Spérgula. The plants of this order are found most abundantly in Europe, and least so in Africa and South America.

Order 27. LÍNEÆ.—THE FLAX FAMILY.

Though this is a very small order, it is a very important one, containing, as it does, plants which are of the greatest use to man. The genus *Lìnum* is the principal one in the order. From the fibre of the stems of the common Flax (*Lìnum usitatíssimum*), a British annual plant with lovely blue flowers, linen is made; and from the seeds, when crushed, oil is obtained, and linseed cake for feeding cattle is made.

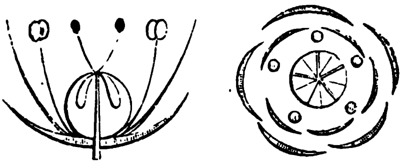


Fig. 97.—Diagram of the parts of the flower in the order Líneæ.

Order 28. MALVÀCEÆ.—THE MALLOW FAMILY.

The plants contained in this order, many of which are extremely beautiful, bear so striking a resemblance to each other, that they may generally be easily recognised. The greater part of the Malvàceæ will be found clothed with stellate pubescence; and in the flowers of all there is a central column, round which are placed numerous carpels, which grow together and form a many-celled capsule: the anthers are one-celled and kidney-shaped. There is always an involucre below the calyx, differing, however, in the different genera. In the genus Málva, the involucre consists of three leaflets, which, in the common Mallow (*Málva sylvéstris*), are oblong. The petals are wedge-shaped, and they are set so far apart that light can be seen through them. The stamens, all of which are nearly of the same height, form a kind of bunch round the styles, which are pointed. The capsule consists of a circle of woolly-looking carpels, growing close together, but easily detached with a pin, and each fitting into a little groove in the receptacle in which they are placed. As the seeds ripen, the involucre falls off, but the large loose-looking calyx remains on. There is only one seed in each carpel, but as there are generally eleven carpels in each capsule, each seed-vessel contains this number of seeds. The leaves are lobed and toothed, and the whole plant is covered with long hairs, which are disposed in little star-like tufts. In the genus Málope, which closely resembles the Mallow in many particulars, the petals are not wedge-shaped, and the calyx is still larger, the long sepals shrouding the capsule as the involucre of the filbert does the nut. The involucre is composed of three broad, heart-shaped leaflets, which remain on till the seed is ripe. The petals are not so even

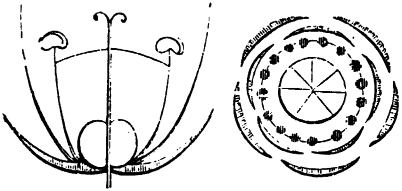


Fig. 98.—Diagram of the flower of Malvàceæ.

along the margins as those of Málva, and the carpels are so arranged as to form a cone-shaped capsule instead of a flat one. In the genus Lavátera (the Tree Mallow) the leaflets of the involucre are joined to the middle, and form a kind of three-cornered saucer below the capsule, the capsule being completely covered with a part of the receptacle, which is dilated and curved down over it. And, in the genus Althæ̀a (the Marsh Mallow) the involucre is cleft into six or nine divisions, and the carpels united into a globular capsule.—As well-known plants belonging to this order, in addition to those already mentioned, are the following: the Hollyhock (*Althæ̀a ròsea*), the Althæa frutex (*Hibíscus syrìacus*), and numerous other very beautiful species of Hibíscus, and the Cotton plant (*Gossýpium*). This last furnishes the down which is used to an enormous extent in the cotton manufacture. This down is found lining the capsules which contain the seeds, and if examined by the microscope, the threads will be seen to be finely toothed, which explains the cause of their adhering together so readily. There are several species cultivated for the supply of cotton in different parts of the world: *G. herbàceum* is, however, the species most commonly grown. *G. hirsùtum* and *G. barbadénse* are two species grown in the West Indies; while in the East Indies and in China the kinds are *G. herbàceum*, *G. arbòreum*, and some other species (especially that which produces the nankeen-coloured down). An oil is obtained from the seeds of all the species; while in the Levant the seeds of *G. herbàceum* are eaten, and are considered wholesome and nutritive.—All the Malvàceæ abound in nutritive mucilage; and the strong woody fibre found in the stems of many may be successfully employed in the manufacture of paper, ropes, and other articles.

Order 29. BOMBÀCEÆ.—THE SILK-COTTON-TREE FAMILY.

This order is closely allied to Malvàceæ, differing chiefly in the tube formed by the stamens being divided into five bundles or sets near the top, and in the calyx being imbricated. The plants composing it are mostly fine trees with large showy flowers, natives of the tropics. Some of them are among the largest trees in the world, as the Baobab, or Monkey bread of Senegal (*Adansònia digitàta*), a trunk of which has been seen with a diameter of twenty-five feet; and the Silk-Cotton-Tree (*Bómbax Ceìba*), and the *Eriodéndron anfractuòsum* sometimes attain the height of a hundred feet. The Hand-plant of Mexico (*Cheirostèmon platanöìdes*), the flowers of which resemble considerably a hand furnished with long claws, is another large tree, frequently attaining the height of a hundred feet, with a stem fifteen feet in diameter. The down which envelopes the seeds of Bómbax cannot be spun into thread without an admixture of cotton.

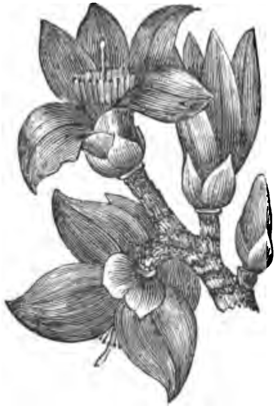


Fig. 99.—Bómbax.

Order 30. BYTTNERIÀCEÆ.

The plants included in this order much resemble those contained in the last two orders, the chief difference being in the flowers having two-celled anthers. Many of the species of the genus *Stercùlia* are fine trees, with large handsome leaves, and produce large seeds, which are eatable. Another, and a very important plant, is the *Theobròma Cacào,* from the fruit or seed of which cocoa and chocolate are prepared. The *Astrapæa Wallíchii* is a noble plant with large heads of brilliant pink flowers, and large dilated stipules at the base of the leaves.—All the plants in the order possess mucilaginous qualities.

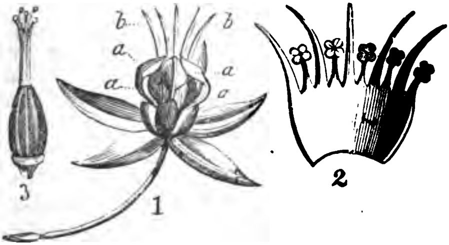


Fig. 100.—Flower of Theobròma Cacào. 1, complete flower; *a, a,* the petals; *b, b,* the petal-like stamens; 2, the tube formed by the adhesion of the stamens, cut open, showing the five true stamens alternating with five abortive; 3, pistil, with a single style composed of five adherent carpels, and surmounted by five separate stigmas.

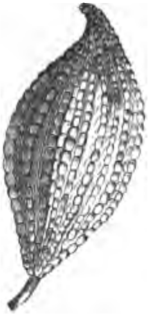


Fig. 101.—Fruit or Capsule of Cacao-plant, containing the seeds or nuts.

Order 31. TILIÀCEÆ.—THE LINDEN FAMILY.

The Lime (*Tília*), which gives the name to this order, is well known. It is a very graceful tree, and produces delightfully fragrant flowers. The whole plant abounds in mucilage. The inner bark is very tough, and is used for making Russian mats, commonly called bast mats. The wood is of very fine texture, soft and white, and much used for carving. The roasted nuts or seeds of the lime are said to bear some resemblance to chocolate. The fibres of the bark of *Córchorus capsulàris* are twisted into fishing-lines. The leaves of *Córchorus olitòrius* are used in Egypt as a vegetable. The plant formerly called *Córchorus japónicus*, a shrub with bright-yellow flowers, common in our gardens, is now called *Kérria japónica*, and placed in the order *Rosàceæ*. The excellent light timber called Trincomalee wood, employed in the construction of the Massoola boats of Madras, is furnished by *Bérrya Ammonílla.*

Order 32. ELÆOCÁRPEÆ.

These plants differ from the Tiliàceæ simply in having their petals lobed, and in their anthers opening by two pores at the apex. The flowers of some species of *Elæocárpus* are fragrant, and the fruit is eatable: the furrowed, sculptured seeds of one species, being freed from their pulp, form handsome necklaces, which are not uncommonly set in gold and sold in the shops.

Order 33. CHLÆNÀCEÆ.

This order is composed of shrubs and small trees with showy flowers, usually of a red colour, and simple, alternate, stipulaceous leaves. They are natives of Madagascar.

Order 34. TERNSTRŒMIÀCEÆ.

These are trees or shrubs with handsome flowers, which are usually white or yellow, seldom pink or red. The Loblolly Bay (*Gordònia Lasiánthus*) is a shrub with white flowers about the size of a rose, a native of North America; and Stuártia and Malachodéndron are beautiful shrubs or low trees with large white flowers, also natives of North America.

Order 35. CAMELLIÈÆ.—THE CAMELLIA FAMILY.

The two genera in this order are Caméllia and Thèa, the former remarkable for the beauty of its flowers, and the latter one of the most useful plants in the world. They are natives of China, Japan, or Nepal. The *Caméllia japónica* is the species from which the greater part of the camellias in our gardens have sprung. Of the other species, perhaps the most striking is *C. reticulàta,* which produces very large, widely-spreading flowers, of a remarkably rich crimson. The leaves are reticulately veined, and of a much finer texture than those of *C. japónica.* The small semi-double flowers of *C. maliflòra,* coloured like the blossom of the apple, are very pretty. Another species, the young leaves of which are sometimes dried and mixed with tea, is *C. Sasánqua,* which has white flowers. From the seeds of *C. oleífera* a fine oil is obtained. The plants which furnish us with tea are very nearly allied to the camellia. There are three species, viz., *Thèa Bohèa, T. víridis,* and *T. assaménsis.* The leaves of *T. víridis* make both green and black teas in the northern district of China, from which the foreign markets are chiefly supplied; whilst in the neighbourhood of Canton, teas of both kinds are obtained from *T. Bohèa.* The flower of *T. víridis* has a footstalk; there are five sepals to the calyx; and the filaments of the stamens do not grow together. The capsules are three-seeded; and the dissepiments are formed by the edges of the valves being bent inwards, instead of being attached to a central axis. The outside of the capsule is quite smooth, and not furrowed as in the camellia. Both the flowers and leaves of *T. Bohèa* are smaller than those of *T. víridis*. The Assam Tea is furnished by *T. assaménsis*.

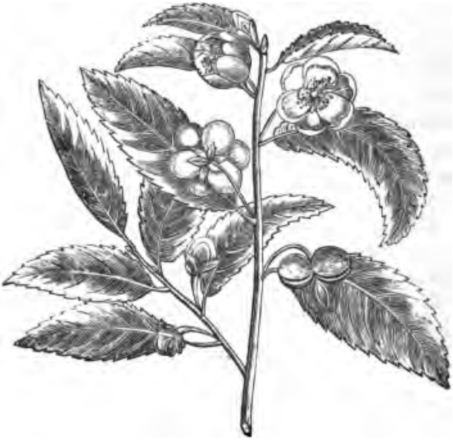


Fig. 102.—Tea-plant.

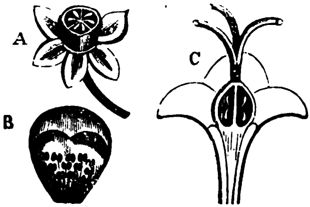


Fig. 103.—Structure of Flower of Tea-plant. A, calyx, with ovarium cut across. B, petal, with bundle of stamens adherent to it. C, vertical section of ovarium, with the three styles.

Order 36. Olacíneæ.—The Olax Family.

This small order consists of tropical or nearly tropical shrubs, chiefly found in the East Indies, New Holland, and Africa. Only one is known in the West Indies. The wood of one plant of this order (*Heistèria coccínea*), a native of Martinique, is often said to be the partridge wood of the cabinet-makers; but this does not appear to be correct, as Aublet says the wood in question is the produce of a Cayenne tree, growing sixty feet high, called *Bocòa provacénsis.*

Order 37. Aurantiàceæ.—The Orange Family.

The trees and shrubs in this order are of very great utility. The best known genus is Cìtrus, which contains the Citron (*C. médica*), the Sweet Lime (*C. Limétta*), the Lemon (*C. Limònum*), the Forbidden Fruit (*C. Paradìsi*), the Shaddock (*C. Decumàna*), the Sweet Orange (*C. Aurántium*), the Seville or bitter Orange (*C. vulgàris*), and the Mandarin Orange (*C. nóbilis*). All the species agree in having a tube-like calyx,

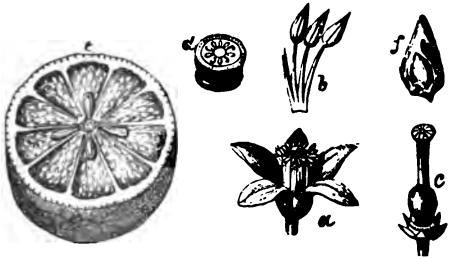


Fig. 104.—Cìtrus Aurántium. *a*, flower; *b*, stamens, to show the union of the base of the filaments; *c*, pistil; *d*, transverse section of the ovary; *e*, ditto of the fruit; *f*, seed.

scalloped into five short teeth, and a corolla of generally five fleshy petals (though the number occasionally varies from four to nine), which are elliptic in shape, concave, and always widely opened. The stamens, which are in the centre of the flower, vary from twenty (the ordinary number) to sixty: the anthers are two-lobed, and oblong; and the filaments are somewhat thickened at the base, and united there into several small bundles, but free above. The pistil has a somewhat globular ovary, a cylindrical style, and a stigma slightly raised in the centre. The disk in which the stamens are inserted forms a ring round the ovary. The fruit, considered by botanists to be a kind of berry, is a seed-vessel with numerous cells, divided by dissepiments and a central placenta; the cells being the quarters of the orange, the dissepiments the divisions between them, and the placenta the central pith. When the flower first expands, the ovary, if cut open and examined, will be found to be divided into several cells, each containing two rows of ovules. Many of these ovules, however, become abortive, and as the cells fill gradually with cellular pulp, the seeds become detached from the placenta and buried in it. The seeds themselves are very interesting: if examined, it will be seen that they are covered with a thick wrinkled skin, and show distinctly the hilum, the chalaza, and the raphe or connecting cord between them, parts which are seldom distinguishable in seeds with the naked eye. If the leaves, calyx, and petals of the orange be held up to the light, they will appear covered with little dots. These dots are cells covered with a transparent membrane, and filled with oil, which is exceedingly fragrant. The rind of the fruit is covered with similar cells, filled with a pungent oily liquid.—The productiveness of the common orange is enormous. A single tree at St. Michael's has been known to produce twenty thousand oranges fit for packing, exclusively of the damaged fruit and the waste, which may be calculated at one-third more. It has been calculated that more than two hundred and seventy-two millions are annually imported!—Most of the plants in this order are natives of China and the East Indies. Their wood is particularly hard and close-grained. Besides the orange and other fruits already enumerated, which are the most remarkable products of the order, the Wampee (a fruit highly esteemed in China) may be mentioned. It is the produce of *Coókia punctàta.*

Order 38. HYPERICÍNEÆ.—THE ST. JOHN'S WORT FAMILY.

The genus *Hypéricum* (the St. John's Wort) is that which is best known in this order, of which it is the type. In Hypéricum the leaves, like those of the orange, are full of transparent cells, which contain a yellow resinous juice, resembling gamboge in its medicinal properties, and having a disagreeable smell. The flowers are very showy, from their large golden yellow petals and numerous stamens. The handsomest species of the genus is *H. calycìnum;* but *H. perforàtum* is the species of St. John's Wort which the country people used formerly to gather on Midsummer-eve as a preservative against witchcraft. The tutsan, or park-leaves, has been separated from Hypéricum, and is now called *Androsæ̀mum officinàle.* The plants of the order are very generally spread over the different parts of the earth, inhabiting mountains and valleys, marshes and dry plains, meadows and heaths.

Order 39. GUTTÍFERÆ.—THE MANGOSTEEN FAMILY.

The trees and shrubs forming this order are all natives of the tropics, the greater part of South America; a few are from Madagascar and the continent of Africa. They generally require situations combining excessive heat and humidity. The plants of most interest are the Mangosteen (*Garcínia Mangostàna*), by many considered the finest of all fruits; and the tree producing the Gamboge (*Garcínia Gambògia*), which is the juice of the tree.

Order 40. MARCGRAAVIÀCEÆ.

This order consists of curious half-climbing shrubs rarely seen in Britain, all natives of hot countries. Some of them bear among the flowers, which are large and showy, singular hollow bodies, like the pitchers of Sarracènia.

Order 41. HIPPOCRATEÀCEÆ.

The species forming this order are tropical arborescent or climbing shrubs, with opposite simple leaves, and small inconspicuous flowers.

Order 42. ERYTHROXÝLEÆ.—THE RED WOOD FAMILY.

These are shrubs or low trees, with simple alternate leaves furnished with axillary stipules. They are chiefly natives of the West Indies and South America (Brazil within the tropics is their favourite haunt), but a few are found in the East Indies, the Mauritius, and Madagascar, and one in New Holland. The wood of some is of a bright red. A permanent reddish-brown dye is obtained from the bark of *Erythróxylon suberòsum.* The *Erythróxylon Còca* is a plant much used by the miners of Peru for its remarkable power in stimulating the nervous system, in which respect it quite resembles opium. Its leaves are chewed with a small mixture of finely-powdered chalk. The effects of chewing the coca leaf are similar to those produced by the immoderate use of opium.

Order 43. MALPIGHIÀCEÆ.—THE BARBADOES CHERRY FAMILY.

The genus *Malpíghia* (the Barbadoes Cherry) is the one best known in this order, which consists of trees or shrubs with pink or yellow flowers, some having a climbing habit, and nearly all of them being tropical. The undulated, unguiculate, spreading petals of the corolla form one of the most marked characters of the plants in this order. When closed the corolla resembles that of a Kálmia; but when expanded, the flower is more like that of a Clárkia, from the long claws of the five petals, and the distance they are placed apart. Several of the species have their leaves and stems beset with stinging bristles, which adhere to the hand when touched. The fruit, which is eatable (though it is insipid), is a berry-like drupe, containing three one-seeded nuts. The leaves of the common Barbadoes Cherry (*Malpíghia glàbra*) are destitute of the stinging bristles. Some of the species of the genus Banistèria (which are generally climbing shrubs, with beautiful feathery yellow flowers) are occasionally found in stoves in this country.

Order 44. ACERÍNEÆ.—THE MAPLE FAMILY.

This is a small order, the two principal genera of which are Àcer and Negúndo. Of the species of Àcer, two are British, viz., the Common Maple (*A. campéstre*) and the Sycamore (*A. Pseùdo-Plátanus*). All the maples are trees, and are remarkable for the striking effect they produce in the landscape, and for the rich yellow and brown tints which their leaves assume in the autumn. The flowers of the sycamore (which are partly male and female and partly perfect) are not very conspicuous, and they are produced in drooping racemes. In the perfect flowers there are eight stamens and two stigmas; and the ovary, when ripe, expands into a curiously-winged pod, called a samara, with a thickened part at the base containing the seeds. There are many species of Àcer, and all the larger species abound in a very saccharine sap, from which sugar is prepared in North America. Though it is chiefly made from *Àcer sacchárinum* (the Sugar Maple), it may be obtained from many others. A tree of an ordinary size yields, in a good season, from twenty to thirty gallons of sap, from which are made five or six pounds of granulated sugar. The bark of the maples is astringent, and yields the dyer reddish-brown and yellow colours: the timber is light and useful. The Ash-leaved Maple or Box-Elder (*Negúndo fraxinifòlium*) has compound leaves resembling those of the ash (it is, indeed, called in North America the black ash), and long pea-green shoots. The male and female flowers are on different trees, and are very small. The racemes of samaras or keys which succeed the flowers are, however, very conspicuous.—The plants of this order are found in Europe, the temperate parts of Asia, the north of India, and North America. None are found in Africa.

Order 45. HIPPOCASTÀNEÆ.—THE HORSE CHESTNUT FAMILY.

All the plants in this order are hardy trees, remarkable for the striking effect produced by their leaves and flowers. The two genera contained in the order are Æsculus (the Horse Chestnut) and Pàvia (the Buckeye), the latter being easily distinguished from the former by the smooth husk which covers the seed or nut. There are few who do not know the flowers and nuts of the common horse chestnut (*Æsculus Hippocástanum*); but the Scarlet Horse Chestnut (*Æ. rubicúnda*) is not so well known. In the flowers of this species the calyx is tubular, and there are only four petals, the upper two of which have bearded claws, and are narrower than the lower ones. There are sometimes eight stamens. The nut or seed of the horse chestnuts is strongly marked with the hilum; but the seed of the Pàvia has only a small hilum, resembling the pupil of an eye, and hence the genus has received its American name of Buckeye. The nut of one species of this genus (*P. macrostàchya*) is eatable, and very much resembles the sweet chestnut when boiled in milk. The seeds or nuts of the horse chestnut are an excellent sheep-food, and they are carefully collected for this purpose in Switzerland. They have also been recommended as a substitute for coffee.

Order 46. RHIZOBÒLEÆ.

This order agrees with Hippocastàneæ in the insertion of the petals and stamens, and in having opposite palmate leaves, but differs from it in having a large radicle and small cotyledons, and not a small radicle and large cotyledons, as in that order. The principal genus is Caryòcar, one or two species of which (*C. nucíferum* and *C. butyròsum*) produce the excellent Souari or Suwarrow nuts of the fruiterers' shops. From these nuts an oil is extracted not inferior to that of the olive. The wood of these large South American trees is said to be of much value for ship-building.

Order 47. SAPINDÀCEÆ.—THE SOAP-TREE FAMILY.

Nearly all the plants in this order are trees or shrubs with compound leaves and bunches of white flowers; a few are climbing herbs. They are natives of most parts of the tropics, but especially of South America and India. The only plant in the order which will bear the climate of England is *Kölreutèria paniculàta*, a small tree with very elegant leaves, and panicles of pale yellow flowers, which are succeeded by bladdery capsules. The rind and pulp of the fruit of the Soap Berry (*Sapíndus Saponària*) are used in the West Indies instead of soap. The nuts of this plant are round and hard, and they were formerly made into buttons and beads, and were very durable. Other interesting plants in this order are the Litchi, or Leechee (*Nephèlium Litchì*), and the Longan (*N. Longán*), two delicious Chinese fruits which are sometimes procurable in this country and seen in the dessert. The fruit also of the Akee-tree (*Blìghia sápida*), a native of Africa, has a grateful subacid flavour, and is much esteemed.

Order 48. MELIÀCEÆ.—THE BEAD-TREE FAMILY.

Of the trees and shrubs forming this order several are of considerable interest. The Bead-tree, the Pride of India or Indian Lilac (*Mèlia Azedarách*), a native of Syria, has become almost naturalised in the south of Europe, particularly near the Mediterranean.

The leaves of this plant are bipinnate, and the flowers, which are lilac-coloured, are produced in long loose bunches, being succeeded by pale yellow berries about the size of a cherry. These berries consist of pulp (which is highly poisonous), enclosing a nut. The nuts are bored and used for making rosaries by the Roman Catholics. Another interesting plant is the Mahogany-tree (*Swietènia Mahágoni*), which grows to the height of eighty feet, with a wide handsome head, and furnishes the timber so much used in this country. It grows in the warmest parts of America, in Cuba, Jamaica, Hispaniola, and other places. The trees on the Bahama Islands are not so large, but are more curiously veined, and are known in Europe as Madeira wood. They generally grow on the solid rock, where there seems to be no earth for their nourishment. Mahogany, like other timber, varies in durability, firmness of grain, and other circumstances, according to the soil on which it is grown. The best is furnished from the rocky soils of St. Domingo and the Bahama Islands. Other trees are the West Indian Cedar (*Cedrèla odoràta*), and the *Chloróxylon Swietènia*, which furnishes the satin wood, and is one of the plants yielding the wood oil of India.

Order 49. AMPELÍDEÆ.—THE VINE FAMILY.

The most important plant in this order is the grape-vine, which supplies us not only with wine, but with the dried fruit called Raisins and Currants (*Corinths*). The Common Grape (*Vitis vinífera*) is the species which furnishes most of these products; for though the American kinds have large fleshy berries, they have a disagreeable foxy flavour. If the flowers of the grape-vine be examined, it will be found that though so insignificant, they are perfect, and have each a distinct calyx and corolla. The calyx is very small, remaining on till the fruit is ripe. The petals of the corolla, five in number, remain fastened together at the top, but are separate at the base, detaching themselves when the stamens ripen. The stamens (also five in number) are opposite the petals. The ovary, when young, is two-celled, each cell containing two seeds, and it is crowned with a nearly flat stigma without any style. As is well known, the fruit is a succulent berry, containing from one to four hard seeds. The grape-vine is considered to be a native of the shores of the Caspian. Another plant belonging to this order is the well-known Five-leaved Ivy, or Virginian Creeper (*Ampelópsis hederàcea*), a most useful climber, with the leaves divided into three or five stalked leaflets, and assuming a lovely red tint in the autumn. This is a native of North America. The genus *Císsus* should also be mentioned as containing species with very beautiful leaves, especially the *C. díscolor*.

Order 50. GERANIÀCEÆ.—THE GERANIUM FAMILY.

The three principal genera in this order are Eròdium (the Heron's bill), Gerànium (the Crane's bill), and Pelargònium (the Stork's bill). The first two genera are well known from the British species contained in them; while many of the species of Pelargònium are so commonly seen in our gardens and conservatories, that they are almost equally well known, though generally under the name of Gerànium. These latter are mostly either natives of the Cape of Good Hope, or hybrids raised in Europe from the imported species. In the flowers of the Pelargònium the calyx has five sepals, two of which end in a kind of spur, not very perceptible, however, as it runs down the peduncle or footstalk of the flower, and grows to it, seeming to be only a part accidentally enlarged. The corolla has five petals, the upper two being larger than the others, and generally differently marked. The number of petals varies, however, as there are sometimes only four, and sometimes there are six. The perfect stamens vary from four to seven; but there are always ten filaments, which are dilated and grow together at the base. The pistil, when young, appears to consist of a five-celled ovary, with a long slender style, the tip of which is divided into five slender curved stigmas. The cells of the ovary are, however, five one-seeded carpels, each having a separate style; and though both the carpels and styles appear firmly grown together when young, yet, in fact, they only adhere to an elongation of the receptacle (in this case called the central axis), and from which, when ripe, they part with elasticity, and curl up, the styles, or awns (as they are sometimes called), being hairy inside. (The curling up of the styles is very characteristic of all the plants included in this order.) The seed-vessel is long and pointed, somewhat resembling the head of a stork (and hence the name of Stork's bill); the ovary, shrouded in the persistent calyx, representing the head of the bird, and the long styles the beak. The flowers of all the Pelargoniums are produced in heads or umbels. The leaves vary in shape in the different kinds: in some they are roundish, and marked with a dark band or zone, as in *P. zonàle* (the horse-shoe Pelargònium, which is one of the parents of the beautiful zonal kinds now so common); while in others they are deeply cut, as in the rose-scented kinds. Some species are shrubby, and some herbaceous; in some the stems are warted; and in others the roots are tuberous, of which kind one (*P. trìste*) is eatable. The genus Eròdium differs from Pelargònium principally in having the filaments of the stamens only very slightly united at the base, and in there being five filaments bearing anthers, and five that are sterile, the latter having each a gland at the base. The calyx also has not the spur; and the seed-pod is considered to resemble the head of the heron more than that of the stork. When the seed-pod bursts, the styles (which are hairy inside like those of the Pelargònium) do not curl up in the same manner as they do in that genus, but spirally. The two commonest British species are *E. cicutàrium* and *E. moschàtum*. In the genus Geranium the stamens are all perfect, the alternate ones being longer than the others, and there is a gland at the base of each. The seed-pod is thought to resemble the head of a crane, and when it bursts the styles, which are smooth inside, curl up like the coil of a rope (round and around). The seeds of many of the kinds are beautifully netted. There are a good many British species of geranium, two of the commonest being the Herb Robert (*G. Robertiànum*) and the Meadow Crane's-bill (*G. praténse*). In Van Diemen's Land the fleshy tubers of one species of geranium (*G. parviflòrum*) are eaten by the natives. The plant is there called the native carrot.

Order 51. TROPÆÒLEÆ.—THE NASTURTIUM (OR INDIAN CRESS) FAMILY.

The plants in this order are climbing or trailing herbs with handsome solitary axillary flowers, and fleshy stems and leaves. They are chiefly distinguished from the Geraniàceæ by their stamens being separate, and not agreeing in number with the petals, by their axillary flowers, and fleshy indehiscent fruit.

All are natives of the temperate parts of North and South America. The peculiar acrid flavour so characteristic of the Crucíferæ is found to exist in this order, and it has been remarked that the caterpillar of the cabbage-butterfly feeds exclusively upon Crucifers and Tropæolum, the principal genus in this order, commonly called the nasturtium (from the leaves and stem having a taste similar to that of the water-cress, the botanic name of which is Nastúrtium). To prevent confusion it would be better to call the species of the genus Tropæolum by the popular name of Indian Cress. In the flowers of *Tropæolum màjus* the calyx and the corolla are of the same colour, but may easily be distinguished from each other. The calyx is drawn out into a spur behind; the petals (five in number) are unguiculate (or stalked), and fringed at the base; there are eight stamens; and the three carpels are joined together into a trigonal fruit, each carpel containing one seed. The unripe carpels are sometimes pickled and used as a substitute for capers, to which some prefer them. The daughter of Linnæus was the first to observe that the flowers of this Tropæolum in the evening emit spontaneously, at certain intervals, visible sparks like those of an electric machine. *T. pentaphýllum* is a powerful antiscorbutic, as are probably some of the other species. The root of *T. tuberòsum* is eaten in Peru. The pretty Canary Bird flower, commonly grown in our gardens, is the *T. peregrìnum.* Another genus in this order is Limnánthes, which contains several very pretty species—annuals from California.

Order 52. BALSAMÍNEÆ.—THE BALSAM FAMILY.

One striking and principal character of the plants in this order is the elastic spring with which the valves of the fruit separate at maturity, expelling the seeds. The principal genera are Balsamìna and Impàtiens. The Common Balsam (*Balsamìna horténsis*) is well known, and remarkable for the singularity and varied colours of its flowers, which, if examined, will be found to have a small green calyx of two sepals; a corolla of four petals, one of which is drawn out into a short spur at the base; and five stamens, each bearing a two-celled anther. There are five stigmas, quite distinct from each other, and appearing just above the ovary, without any style. The ovary is one-celled, but it separates into five valves when the seeds are ripe, bursting with elasticity, and the valves curling inwardly from the apex to the base. The peduncles are simple and one-flowered. In the genus Impàtiens, which contains the British plant known by the name of Touch-me-Not (*I. Nòli-me-tángere*), though there are five anthers, as in Balsamìna, only three of them are two-celled, the others having only one cell each. The stigmas are joined together at the base, and the capsule, when ripe, bursts at the slightest touch, the valves coiling up spirally from the base to the apex, and detaching themselves from the plant at the same time that they expel the seeds. The peduncles, which are branched and many-flowered, grow from the axils of the leaves.

Order 53. OXALÍDEÆ.—THE WOOD-SORREL FAMILY.

The regular flowers, beakless fruit, and albuminous seeds are some of the distinguishing characters of the plants of this order. There is also a very general tendency among them to form compound leaves. The species of the genus Óxalis (which gives the name to the order) are the best known. Many of these are natives of the Cape of Good Hope, and the flowers of all are very pretty. In these flowers there are five regular petals (which are spirally twisted in the bud), each petal being furnished with a claw.

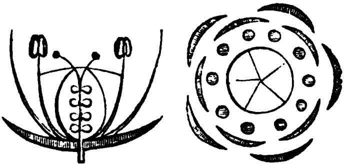


Fig. 105.—Diagram of the flower of the Oxalídeæ.

There are ten stamens and five styles. The capsule is five-celled, and five- or ten-valved, the valves opening lengthwise. All the species have an agreeable acidity, due to the presence of oxalic acid, and may be used in salads. Several species are employed in Brazil as a remedy for certain fevers. The common Wood-Sorrel (*Ŏxalis Acetosélla*), a lovely little plant, is common in many parts of Britain. In the sunshine the leaves are slightly sensitive. By some this little plant is believed to be the genuine *shamrock* of the Irish.

Order 54. ZYGOPHÝLLEÆ.—THE BEAN-CAPER FAMILY.

These plants are remarkable for their opposite leaves and conspicuous stipules; and the hardness of the wood of the shrubby species of the order is most remarkable, especially if the softness of the stems of the herbaceous kinds be remembered. The flowers of the Bean-Caper (*Zygophýllum,* from the leaves being produced in pairs) are usually yellow, the five petals being long, narrow, and placed widely apart. The flowers of Z. Fabàgo are used as a substitute for capers. The great medical virtues of the order are found in the genus Guaíacum, the value residing principally in the bark, which has a rather bitter, acrid flavour. These plants have been found to contain a particular substance differing both from gum and resin, which has been called guaiacine. The foliage is frequently used in the West Indies to scour and whiten floors, which it is said to do better than soap. The valuable wood called Lignum vitæ is furnished by a species of Guaíacum, it is generally said by G. *officinàle*. This wood is remarkable for the direction of its fibres, one layer of which often crosses another diagonally. The brilliant yellow cistus-like flowers of the species of another genus of this order (*Tríbulus*) enliven many an arid waste in the tropics. Meliánthus (the Honey-flower) is another genus belonging to this order. The blossoms of this plant, a native of the Cape of Good Hope, are a great attraction to bees.

Order 55. RUTÀCEÆ.—THE RUE FAMILY.

This order consists of trees, shrubs, or herbaceous plants, the leaves of which are without stipules, opposite or alternate, simple or pinnated, and filled with transparent dots. The Rue (*Rùta gravèolens*) is common in gardens, and is well known from the strong disagreeable smell of the leaves, which is caused by the oil secreted in the transparent dots or cells. The flowers, which grow in cymes at the ends of the branches, are of a dingy greenish yellow. They have four sepals, four petals, and eight stamens arising from a fleshy ring surrounding the ovary. The ovary consists of four carpels seated on the elevated ring or receptacle, and united into one mass. These do not stand upright, however, as they usually do, but spread away from each other at the base, being arranged on the sides of a conical disk, which rises up between them, but is not continued into the style. This disk is termed the *gynobase,* or base of the female organs. The style is single, but it separates at the top into four stigmas. The seed-vessel, when ripe, splits into four valves, leaving the thick hard gynobase in the centre. The number of seeds contained in each varies considerably, but is almost always less than that of the ovules. In the common rue there are usually four ovules in each cell, but only one is developed into seed. In other genera the ovules and seeds are more numerous. In the Fraxinella (*Dictámnus Fraxinélla*) the petals are unequal: there are ten stamens and one style, the carpels being two-seeded. This plant abounds in volatile oil to such a degree that the atmosphere surrounding it becomes inflammable in hot weather. This may easily be tested by placing a lighted candle under a flowering spike in the evening in summer. In Diósma there are only five stamens, the style being arched, and the capsule consisting of five horned carpels. In Corræa the leaves are opposite, there are eight stamens, and the four petals grow together into a tube at the base; while in Cròwea the leaves are alternate, and there are five sepals, five petals, and ten stamens. Other genera are Zanthóxylum, Ptèlea, and Ailántus. Two species of Zanthóxylum (the Tooth-ache tree) are said to have been used successfully in cases of tooth-ache and rheumatism. The curiously winged fruit of *Ptèlea trifoliàta* (the Shrubby Trefoil) has a strong, bitter, aromatic taste, and is said to have been used with some success as a substitute for hops. The *Ailántus glandulòsa* (Tree of Heaven) is a very handsome tree, a native of China, with remarkably long compound leaves, thriving well in Kensington Gardens and other places in the neighbourhood of London. The wood of this tree is hard, heavy, and glossy like satin, and susceptible of a very fine polish. One kind of silkworm (the fine caterpillar of *Bómbyx Cýnthia*) feeds on the leaves of the Ailántus. Another plant of interest is a species of Galipèa (either *G. Cuspària* or *G. officinàlis*), which is said to furnish the celebrated Angostura bark, so extremely valuable in cases of malignant fever.

Order 56. SIMARUBÀCEÆ.

The plants forming this order are trees or shrubs, natives of tropical America, India, or Africa, with an intensely bitter bark, a milky juice, and pinnated leaves. The *Simarùba officinàlis* is well known as possessing the most pure and intense bitter hitherto discovered. The bark of *Quássia amàra* (a very ornamental plant, with bright red flowers and leaves not unlike those of the common ash) is sometimes used as a substitute for hops.

Section 4.—*Fruit gynobasic; that is, inserted into a fleshy receptacle, with which the style is continuous.*

Order 57. OCHNÀCEÆ.

These are smooth trees, or more generally undershrubs, sometimes downy, and having a watery juice. The strongest mark of recognition is the large fleshy gynobase, or torus, of the species constituting the order. Most of the plants are bitter; and they are found in tropical India, Africa, and America.

Order 58. CORIARIÈÆ.

The few shrubs contained in this order, which are included in one genus (Corièria), are inhabitants of the south of Europe, Chili, Peru, New Zealand, and Nepal. Two species (*Corìaria myrtifòlia* and *C. ruscifòlia*) are used by dyers for dyeing black. The fruit is very poisonous.

Subclass 2.—CALYCIFLÒRÆ. *Petals separate, inserted in the calyx.*

Order 59. CELASTRÍNEÆ.

These are shrubs or small trees, with simple, rarely compound, alternate or opposite leaves, and axillary cymes of inconspicuous flowers of a greenish or white or purple colour. The genera best known in the order are Staphylèa (the Bladder Nut), Euónymus (the Spindle-tree), Celástrus (the Staff-tree), Ìlex (the Holly), and Prìnos (the Winter Berry). In the flowers of the Bladder Nut (*Staphylèa pinnàta*), a British plant, the calyx is in five divisions, and white tinged with pink, so as to be scarcely distinguishable from the corolla. There are two or three carpels (which are surrounded by the receptacle), the styles of which adhere slightly together. The capsule is bladdery, consisting of two or three cells, each containing one smooth, brownish, bony seed, which looks as if one end had been cut off at the hilum. The compound leaves have five leaflets. The flowers of the common Spindle-tree (*Euónymus europæus*), also a British plant, are of a greenish white and inconspicuous. The capsules are fleshy and are very beautiful, being of a bright rose colour. The seeds, which are of a bright orange, are enwrapped in a covering called an aril, by which they remain attached to the capsule after the valves have opened. Each capsule has five cells and five seeds, and each seed has a little white stalk (like the funicle of a pea) attached to its aril. The common spindle-tree is deciduous, but some of the species are evergreens, one of which (*E. japónicus*, the Japan Spindle-tree) is frequently seen in gardens and shrubberies. The flowers of most of the species of Celástrus are small and white, of no great beauty. In the flowers of the common Holly (*Ìlex Aquifòlium*) the four or five petals of the corolla are connected at the base: there are four stamens, the cells of the anthers of which adhere to the sides of the filaments. The berry is four-celled, each cell containing a one-seeded nut. The leaves are simple, smooth, shining, and prickly at the edges, which are curved upwards. The beautifully white wood of the holly is extremely hard, and much used by turners and cabinet-makers, especially in the manufacture of the pretty inlaid work known as Tonbridge ware. The inner bark abounds in a tenacious substance, which, when separated, is known as bird-lime, and used for entrapping birds. The leaves are bitter, and it is asserted that they are equal to Peruvian bark in the cure of intermittent fever. Of the leaves of one species of holly (*I. paraguayénsis*), the celebrated Paraguay tea, or maté, or Jesuits' tea, is made. This tea is extensively used in Brazil and other parts of South America. The leaves of *Prìnos glàber* (a little North American evergreen shrub, with black berries) are also used as tea; and the bark of *Prìnos verticillàtus* possesses such active, astringent, bitter, tonic qualities, that it is used in North America, with success, as a substitute for Cinchòna.

Order 60. RHÁMNEÆ.—THE BUCKTHORN FAMILY.

This order consists of trees and shrubs (some being spiny) possessing medical properties somewhat similar to those of the plants in the last order. They are found in nearly every part of the world except the arctic regions. The four best known and most interesting genera are, Zízyphus, Paliùrus, Rhámnus, and Ceanòthus. From the fruit of *Zízyphus Jùjuba* the jujube lozenges are made. The fruit is wholesome and pleasant to eat: it is red and oval, and about the size of olives. The fruit of the African Lote-tree (*Z. Lòtus*), which gave its name to the ancient Lotophagi, is to this day collected for food by the Arabs of Barbary, who call the berries *Nabk.* The *Paliùrus aculeàtus* (Christ's Thorn) may be easily known by its crooked prickly stem, and by the singular appearance of its fruit, which resembles a head with a broad-brimmed hat on, and in allusion to which the French call it *porte chapeau.* Many persons suppose this to be the shrub from which our Saviour's crown of thorns was made, and hence the name of Christ's Thorn. Of the genus Rhámnus there are numerous species, some of which are deciduous and some evergreen shrubs. *R. Alatérnus* is one of the evergreen species, very useful in town gardens, as it is not injured by smoke. The Purging Buckthorn (*R. cathárticus*) is deciduous, with rough feather-nerved leaves, and branchlets terminating in a spine. The berries of this species are used in medicine, and also in colour-making, and sometimes in dyeing; while the berries sold in the shops under the name of French or Avignon berries are the fruit of three other species of Rhámnus, and from which, when unripe, a beautiful yellow is obtained, and, when ripe, from their juice the colour called sap-green is prepared. The leaves of R. Theèzans are used as a substitute for tea by the poorer classes in China. Several of the species of Ceanòthus are known by their terminal upright panicles of extremely pretty blue flowers, especially *C. azùreus, C. floribúndus, C. thyrsiflòrus, C. dentàtus,* and *C. rígidus. C. ameri-*

cànus (sometimes called American Red-root, or New Jersey Tea) has white flowers. The leaves are sometimes dried and used as tea; and the root is used in dyeing wool a nankeen cinnamon colour.

Order 61. BRUNIÀCEÆ.

These are small heath-like shrubs with extremely ornamental flowers and leaves. With the exception of a single species found in Madagascar, they are all natives of the Cape of Good Hope. Their properties are unknown.

Order 62. SAMÝDEÆ.

Tropical shrubs or small trees, principally American, with leaves covered with pellucid dots, and rather inconspicuous axillary flowers. The bark and leaves are said to be slightly astringent.

Order 63. HOMALÍNEÆ.

Handsome evergreen shrubs with alternate leaves and deciduous stipules. They are readily known by their parietal placentæ, an unusual character among the orders that surround them. The species are all tropical, chiefly African or Indian. The handsome half-hardy evergreen shrub *Aristotèlia Mácqui* is one which is sometimes seen in our gardens. The leaves are smooth, shining, and very abundant. The flowers are of little beauty: they are succeeded by small berries of a purple or black colour, which are slightly acid and eatable; and from them the inhabitants of Chili make a wine, which they give in cases of fever, and for curing the plague. The tough bark makes the strings, and the wood the sides of musical instruments.

Order 64. CHAILLETIÀCEÆ.

There are not many genera in this order, which consists of shrubs or small trees with entire alternate leaves (furnished with stipules), and axillary and terminal panicled racemes of small white flowers. The fruit is furnished with a dry covering, enclosing a two- or three-celled nut, each cell containing two pendulous seeds. The species are chiefly natives of tropical Africa and its islands. The fruit of *Chaillètia toxicària* (called Ratsbane in Sierra Leone) is said to be poisonous.

Order 65. AQUILARÍNEÆ.

The plants in this order differ from those in the preceding in the seeds being one on each placenta, as well as in the capsules being two-valved. They are trees with alternate or opposite entire leaves, natives of the tropical parts of Asia, at present very imperfectly known. Aloes-wood, Agila-wood, or Eagle-wood, which contains a fragrant resinous substance of a dark colour, is the inside of the trunk of the *Aquilària ovàta* and *A. Agâllochum.* This substance is considered a cordial by some Asiatic nations, and has been prescribed in Europe in cases of gout and rheumatism.

Order 66. TEREBINTHÀCEÆ.—THE TURPENTINE-TREE FAMILY.

All the species in this order are trees or shrubs, with alternate (often compound) leaves without stipules, and inconspicuous flowers; abounding in a resinous, sometimes acrid, highly poisonous juice, in allusion to which the order has been named. The flowers have generally five petals, and five or ten stamens, and the fruit is drupaceous or capsular, varying in the different genera. Though the flowers are small, many of the species are, from the beauty of their foliage, valuable as ornamental trees; others are useful in the arts or in medicine; and some produce edible fruit. The Cashew and the Pistachio nuts, which are well known, are produced by two plants belonging to this order. The Cashew nut (*Anacărdium occidentàle*) is borne at the extremity of a fleshy pear-shaped peduncle or flower-stalk, which

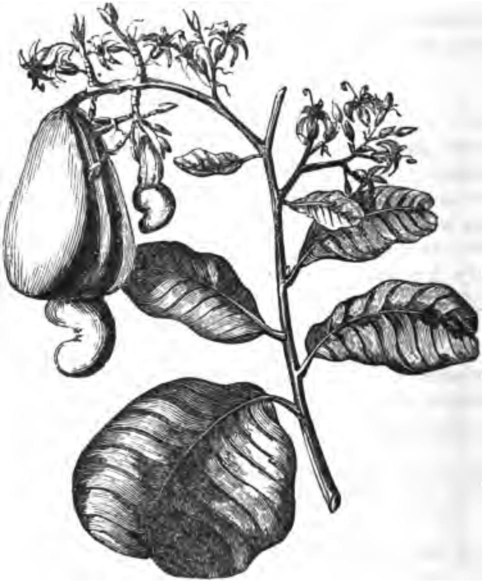


Fig. 106.—Anacărdium occidentàle, or Cashew-tree.

looks more like a fruit than the nut itself. The kernel of this nut abounds with a milky juice, and is much esteemed for its flavour. The juice of the nut of an allied species is of a deep black when ripe, and leaves an indelible stain if applied to linen, so that in it we have an excellent natural marking-ink. The Pistachio nut is the fruit of *Pistàcia vèra*. Other species of the genus Pistàcia of interest are, the Turpentine-tree (*P. Terebínthus*) and the Mastich-trees (*P. atlántica* and *P. Lentíscus*). The most important fruit belonging to the order is the Mango (*Mangífera índica*), which is as highly valued in tropical as the peach is in temperate countries. This fruit, when fully ripe, is yellow and reddish, with a very agreeable juice, and is considered very wholesome. The unripe fruit is pickled. There are several varieties of the mango, differing much in size and flavour. Another fruit is the Hog-Plum (*Spóndias*), of which there are two or three species. And as other interesting trees the following may be mentioned: the Jamaica Birch (*Búrsera gummífera*), which abounds in a watery balsamic fluid, and the root of which is said to possess the same properties as quassia; the Olibanum-tree, one species of which (*Boswéllia serràta*) furnishes the true frankincense of Indian temples; the Balm of Gilead-tree (*Balsamodéndron gileadénse*), which furnishes the well-known balm of Gilead, or balsam of Mecca; the West Indian Balsam-tree (*Amỳris toxífera*), the juice of which is accounted poisonous; and the various kinds of Sumach (*Rhús*), the bark of some of which is used in tanning leather, all the species (especially *R. vérnix* and *R. Toxicodéndron*) being extremely poisonous. The leaves of many of the species of Rhús assume a beautiful red tint in autumn.

Order 67. LEGUMINÒSÆ.—LEGUMINOUS PLANTS, OR THE PEA FAMILY.

This is a very large order, containing nearly seven thousand species, and among these are a great number of well-known and most useful plants. Some are herbaceous, some are shrubs, and others are large trees, and they vary greatly in appearance. They have alternate leaves, which are generally compound, the common petiole being frequently tumid; they have also two stipules at the base of the petiole, and frequently two others to each leaflet. Usually the pedicels are articulated, and the flowers are furnished with small bracts. The flowers have a five-parted calyx, and a corolla which is sometimes papilionaceous and sometimes spreading, and which has never more than five petals, though frequently it has less. Generally the fruit is a legume, though sometimes, when there is only one seed, it has the appearance of a drupe. The pea-like flowers, therefore, characterise a large number, and the pods or legumes (which resemble more or less the pod of the common pea) and pinnate leaves a good portion of the remainder. The species composing the order are found more or less in nearly every part of the known world, though they are distributed in extremely unequal proportions; and in general they diminish sensibly in approaching the Pole. The Leguminòsæ have been divided into three suborders or tribes, the first of which is called Papilionàceæ, from the flowers of the plants included in it being supposed to resemble a genus of butterflies the scientific name of which is Papílio. The flower of the Sweet Pea (*Láthyrus odoràtus*) may be regarded as a type of this suborder, and if this be examined it will be found that it has a small green calyx cut into five divisions, not generally considered regular sepals. The corolla has five petals, the largest of which stands erect, and is called the vexillum; below this are two smaller petals, called the alæ or wings; and below these again are two other petals, joined together so as to form a kind of boat, called the carina or keel, and serving as a cradle for the stamens and pistil. There are ten stamens, nine of which have the lower half of their filaments growing together and forming a fleshy substance at the base, the other being free. The ovary is oblong, and terminates in a filiform style with a pointed stigma: it is one-celled and many-seeded, the seeds being the peas. When the petals fall, the pod still retains the calyx and the style, and these remain on till the seeds are ripe, when the pod divides naturally into two parts, or valves, as they are called, which curl back and discharge the seeds. On examining the pod before it bursts, it will be found that the valves are composed of a fleshy substance, lined with a strong membrane or skin, and that they are united by two seams, called the dorsal and ventral sutures. Along the ventral suture there runs a kind of nerve, called the placenta, to which the peas are attached, each pea being furnished with a little separate stalk, called a funicle. The pod of the pea, then, it will be readily seen, is a character by which the greater part of the plants of the order may be easily distinguished. The flowers vary in the different genera: in some the calyx is tubular, and in others it is inflated; in some the calyx has only four notches, or teeth as they are called, instead of five (as in the pea), and in others it has five distinct sepals divided to the base. Again, the parts of the corolla vary also in proportion to each other, the keel in some of the Australian plants of the order being as long as the standard (as is the case in *Kennèdya Marryáttæ*); while in others the wings are so small as to be scarcely visible. In many of the species the stamens are also free, that is, divided to the base, and in others they resemble those of the sweet-pea in having nine joined together and one free; while in others the whole are joined together at the base. The pods, also, vary very much in size and form; sometimes they are nearly round and only one- or two-seeded, and sometimes they are long and contain many seeds, as in the common bean and pea. Again, the seeds vary so much that the tribe has been divided into two sections: the one containing those plants the seed of which, when it begins to germinate, divides into two fleshy seed-leaves or cotyledons (like the common bean), and the other, those having thin seed-leaves. The seeds of papilionaceous plants which have thin cotyledons are not eatable, but those having fleshy cotyledons may be safely used as food. The fleshy cotyledons do not always rise above the ground, but they do so in the bean and the lupine, and may be easily examined to notice how much they differ from the true leaves. Of plants having thin seed-leaves, the seeds of which are not eatable, the following may be mentioned as examples: the common Furze (*Ùlex europæ̀us*), the Spanish Broom (*Spártium júnceum*), the common Broom (*Cýtisus scopàrius*), and both of the Laburnums (*Cýtisus Labúrnum* and *C. alpìnus*). (The seeds of the laburnums are very poisonous.) It is in the papilionaceous section of the order that we find the greatest number of useful plants possessing wholesome qualities. Clover, lucerne, and saintfoin are well-known fodder plants; and peas, beans, lentils, the underground kidney-bean (*Árachis hypogæ̀a*), and many others, are common articles of food under the name of pulse. The roots of the Liquorice (*Glycyrrhìza glàbra*) contain an abundance of sweet mucilaginous juice, which, as is well known, is much esteemed; and the roots of *Àbrus precatòrius* possess the same properties. Many are useful as medicine (as the scorpion senna, African kino, East Indian kino, &c.); a few produce gum (as tragacanth); some are useful in dyeing (as indigo, &c.); and several furnish excellent timber (as the laburnum, the robinia, and the rosewood).

A great many of the papilionaceous plants, too, are remarkable for the great beauty of their flowers, as the *Wistària sinénsis*, with its long racemes of a delicate lilac colour; the Erythrìna, or Coral-tree, and the Cliánthus, or Glory Pea, with their deep crimson flowers; the various species of Choròzema, Indigófera, Clitòria, Kennèdya, Lupìnus, and many other genera.

The second suborder of the Leguminòsæ is called Mimòseæ, and it comprises those plants which have their flowers in spikes or balls, as the acacias and mimosas. The flowers of the different kinds of Acàcia vary in having a corolla which has sometimes only four petals, these being occasionally united at the base, and a calyx which is sometimes only four-cleft. In some the flowers are in spikes, and in others they are in balls. In *Acàcia armàta*, a pretty, well-known greenhouse plant, the calyx is five-toothed, the corolla has five petals, quite regular in shape, and the stamens vary from ten to two hundred in each flower, and are raised so much above the petals as to give the light tuft-like appearance which is so striking in these flowers. The legumes are large in proportion to the flowers. The valves of these legumes are not fleshy, as in the pea, but dry and hard, and when they open they do not curl back. In the plants of this Acàcia, as usually seen in greenhouses and conservatories, what appear to be the leaves are, in fact, only the petioles of the leaves dilated into what are called phyllodia; the true leaves (which are bi-pinnate, see fig. 31, in page 16) having fallen off, or never unfolded. (On seedling plants the true leaves may often be seen.) The stipules of the leaves (which are to ordinary leaves what bracts are to flowers) are, in this Acàcia, converted into spines. In some kinds of Acàcia the true leaves, with the petioles in their natural state, are retained in the adult plants, as in *A. dealbàta;* and in others the bi-pinnate leaves are occasionally found attached to the phyllodia, as in *A. melanóxylon.* The bi-pinnate leaves have from six to twenty pairs of pinnæ, each consisting of from eight to forty pairs of small leaflets. The Gum Arabic tree (*A. vèra*) has leaves with only two pairs of pinnæ, but each pinna has eight or ten pairs of small leaflets. Of the genus Acàcia there are several hundred species known. In the genus Mimòsa the flower differs from that of Acàcia in the corolla being funnel-shaped, and four or five-cleft; and there are seldom more than fifteen stamens, which are generally on longer filaments than those of the Acàcia. The legume is compressed and jointed or articulated between the seeds, so that the part containing one seed may be broken off without disturbing the rest. The Sensitive Plant (*Mimòsa pudìca*) is a well-known species of this genus.—The cotyledons of the plants included in this suborder are generally leafy; and the seeds are not eatable. Most of the plants may be easily recognised by their ball-shaped or tassel-like heads or spikes of flowers, each of which has a small, cup-shaped, inconspicuous corolla, and a great number of long stamens; and by their pinnate leaves, or phyllodia supplying the place of true leaves. Some of the plants included in this suborder are useful as furnishing gum; others supply good timber; and the bark of others is used in tanning.

The third suborder of the Leguminòsæ is called Cæsalpinièæ, and the flowers of the plants included in it have generally five regular widely-spreading petals, which are never joined together, and stamens of unequal length, which, with very few exceptions, are also perfectly free. Generally the petals are of the same size and shape, though sometimes, as in the Barbadoes Flower-Fence (*Poincìàna*, or *Cæsalpínia pulchérrima*), four are of the same shape, and one deformed. The filaments of some of the stamens are very long and curve over, but the others are much shorter and erect. The style is long and slender, ending in a pointed stigma. The legume is flat, and it looks as if it were many-celled, from the seeds being divided from each other by a kind of spongy substance frequently found in the pods of plants belonging to this suborder. Other plants of interest are the following: the Carob-tree, or Algaroba-Bean (*Ceratònia Síliqua*), which is considered the locust-tree of Scripture, and sometimes called St. John's Bread. The pods or beans are now frequently used as a substitute for oil-cake in feeding cattle. The dry pulp of the pod, in which the seeds are buried, is sweet and very nutritious, and is supposed to have been the food of St. John in the wilderness, whence the name of St. John's Bread. Singers are said to chew this fruit for the purpose of improving the voice; and the seeds are said to have been the original carat weights of the jewellers. The Tamarind (*Tamaríndus índica*), the pods of which, prepared with sugar, form what are called tamarinds. *Cássia lanceolàta*, the leaves of which furnish senna. The genus Gledítschia, or Honey Locusts, some of which (especially *Gledítschia hórrida*) are remarkable for the large thorns on the trunk and large branches, as well as in the axils of the leaves. The Logwood (*Hæmatóxylon* *campeachiànum*), chips of the wood of which are used for dyeing purple. The Judas tree (*Cércis Siliquástrum*), the wood of which is beautifully veined with black and green, and takes a good polish. And lastly, the most remarkable and beautiful *Amhérstia nóbilis* must be mentioned. The flowers of this wonderful tree are large, of a fine vermilion colour, diversified with yellow spots. When covered with its fine leaves and fully in flower, this tree is described as the most superb object that can be imagined.

Order 68. ROSÀCEÆ.—THE ROSE FAMILY.

This order has been divided into eight tribes, but the genus Ròsa, the type of the order, will be found to contain every form of structure which is essential to the order. In the greater number of the plants the flowers have a calyx with five sepals, combined into a tube at their lower part, but divided above into five lobes; and a corolla, generally with five petals. There are numerous carpels, which are usually enclosed in the fleshy tube of the calyx. The ovary is one-celled, and there is generally only one seed, scarcely ever more than two. The leaves are alternate, generally compound, and always furnished with stipules.

The rose is known by, and a favourite flower with, every one, and is remarkable for its great beauty and delicious fragrance. Not only, however, does the order contain the rose and other plants with flowers or with leaves of the greatest beauty, but in it are also included all the most important of our hardy fruits. For example, the Peach and Nectarine (*Amýgdalus*), the Apricot (*Armenìaca*), the Plum (*Prùnus*), the Cherry (*Cérasus*), the Raspberry and the Blackberry (*Rùbus*), the Strawberry (*Fragària*), the Apple and Pear (*Pỳrus*), the Medlar (*Méspilus*), and the Quince (*Cydònia*). There are also a great many very beautiful hardy flowering trees and shrubs in the order, as the hawthorn and all the other species of the genus Cratægus, and the various species of Spiræa and Cotoneáster. Most of the plants of this order are natives of the cold and temperate regions of the northern hemisphere. There are many British species of rose of great beauty. The cultivated roses are innumerable, and form some of the greatest beauties of our gardens. The petals of *Ròsa moschàta* and *R. damascèna* yield the highly-fragrant essential oil called Attar of Roses. The *R. centifòlia* is the species most extensively cultivated for distilling rose-water. Prussic acid exists in abundance in the leaves and kernels of several genera of the order, more especially of Amýgdalus, Prùnus, and Cérasus. It is found to the greatest extent, perhaps, in the kernel of the Bitter Almond (*Amýgdalus commùnis amàra*), and in the leaves, bark, and fruit of the common Laurel (*Cérasus Laurocérasus*). The genera so abounding in prussic acid, also yield a gum analogous to gum tragacanth; and this affords a strong evidence of the affinity that exists between the Rosàceæ and the Leguminòsæ. The leaves of the Sloe (*Prùnus spinòsa*) and of the Wild Cherry (*Cérasus àvium*) have been employed as a substitute for tea. The common Plum (*Prùnus doméstica*) yields the fruits known under the name of prunes, which are chiefly prepared in France and in Portugal. The wood of the pear is almost as hard as box, and is substituted for it by wood engravers. Malic acid is contained in considerable quantity in apples, and in the berries of the Mountain Ash (*Pỳrus Aucupària*). The mucilaginous seeds of the quince are employed in medicine; and from its fragrant fruits a kind of wine is prepared, analogous to cider and perry, obtained from apples and pears.

The order Rosàceæ nearly answers to the class Icosándria of Linnæus, though there is an exception in the case of the Agrimony (*Agrimònia Eupatòria*), which, having twelve stamens, belongs to the class Dodecándria. (See fig. 107.)

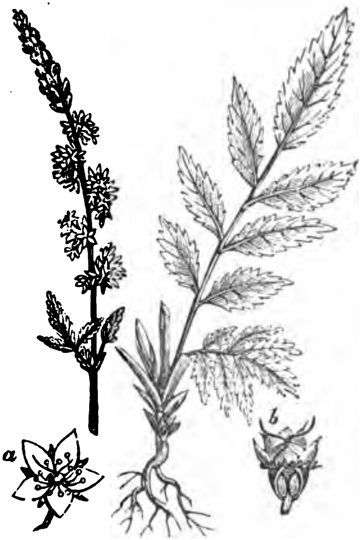


Fig. 107.—Agrimònia Eupatòria: *a*, flower, showing the twelve stamens; *b*, the five pistils.

Order 69. CALYCÁNTHEÆ.

This order differs from Rosàceæ in the form of the embryo, and from Granàteæ in the imbricate æstivation of the calyx; from both in the absence of petals, and in the numerous divisions of the calyx. There are only two genera in the order (Calycánthus and Chimonánthus), both being hardy early-flowering shrubs, natives of North America and Japan, with sweet-scented yellowish or lurid purple flowers, which are either axillary or terminal, and simple opposite exstipulate feather-nerved leaves. The wood, leaves, and flowers of *Calycánthus flóridus* (the American Allspice) are sweet-scented. The bark is used as a substitute for cinnamon in the United States. The flowers of *Chimonánthus fràgrans*, which are yellowish, are produced in the winter, when the plant is without leaves, and are delightfully fragrant.

Order 70. GRANÀTEÆ.

The only genus in this order is Pùnica (the Pomegranate), the fruit of which is well known. The flowers are of a beautiful scarlet; the calyx is valvate in æstivation, and the stamens are indefinite. The leaves are destitute of pellucid dots. It is in the warmer parts of Europe that the Pomegranate (*P. Granàtum*) is cultivated: while in Persia there are entire woods formed of it. The flowers, the fruit, and the bark have long been used in medicine.

Order 71. MEMECÝLEÆ.

A small order of tropical shrubs or trees with opposite, entire, smooth, exstipulate leaves, destitute of dots; axillary or terminal bluish-violet or white flowers; and edible fruit.

Order 72. COMBRETÀCEÆ.

Two of the genera included in this order contain some of the most beautiful climbing plants of the tropics, viz., Combrètum and Quisquàlis. The *Combrètum purpùreum* has racemes of flowers, which have a singularly light and graceful appearance, from the great length of the stamens. As the flowers are of a brilliant scarlet, the specific name of purpùreum has not been appropriately given to the plant. In the flowers of *Quisquàlis índica* the calyx has a very long slender tube, and the corolla has five velvet-like petals, which vary in colour from a yellowish-white to red, changing in the course of a day. Some of the plants of the order are useful, as *Bucìda Bùceras*, the bark of which is used in Guiana for tanning leather; *Terminàlia vérnix*, the juice of which the Chinese use as a varnish; *Terminàlia Benzòin*, the milky juice of which, becoming fragrant on drying and resembling benzoin, is used in churches in the Mauritius as a kind of incense; the kernels of several species of Terminàlia are eaten as almonds, and are very palatable; and some species of Terminàlia and Conocárpus furnish excellent timber.

Order 73. VOCHYSIÈÆ.

The plants forming this order are trees or shrubs, natives of tropical America, with terminal panicles or racemes of showy flowers, and opposite or whorled, entire, feather-nerved leaves, each furnished with two stipules at the base. Little is known of any use to which they can be applied. Their flowers are reputed to be very sweet; and some are said to have a resinous juice.

Order 74. RHIZOPHÒREÆ.—THE MANGROVE FAMILY.

The mangroves are tropical trees, remarkable for growing in the soft mud of large rivers, or on the seashore even as far as low-water mark. These trees generally send down roots from the branches, and thus, like the banyan-tree, rapidly spread over considerable spaces. In *Rhizóphora Mángle* the main trunk is gradually raised high above its original level by the roots assuming an arched form (see fig. 108). The seeds have the singular property of germinating while enclosed within the capsule, and sending down long roots (while yet hanging on the parent tree) which lengthen till they reach the soil, in which they become fixed, and new plants are developed. The purpose of this singular provision is clearly that the

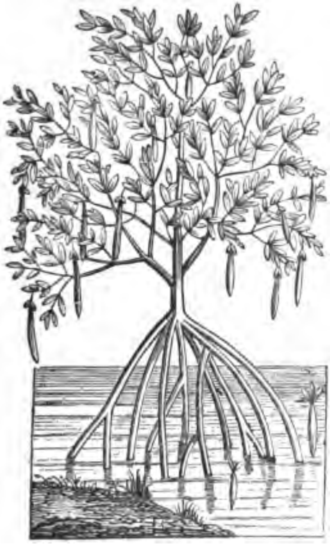


Fig. 108.—Mangrove-tree.

seeds may not be carried by the waves of the sea or by the currents of the rivers far away from the places suitable for their growth.

In the flower of the mangrove (see fig. 109) the calyx consists of four adherent sepals (which are hairy), the petals being equal in number to the sepals, and inserted upon them. The stamens arise from the same point as the petals, and are twice or thrice their number. The ovary is two-celled, each cell containing two or more ovules. In the ripe fruit, however, there is only one cell and one seed. The fruit is said to be sweet and edible, and the juice, when fermented, forms a light wine. The bark of one species of Rhizóphora is used in India for dyeing black.

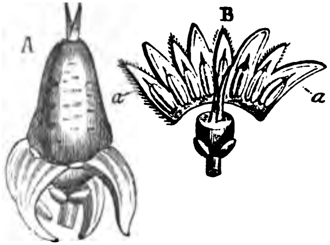


Fig.109.—Parts of the Flower of the Mangrove. A, the fruit, seated upon a calyx of four sepals, and surmounted by two styles. B, a flower cut open, showing four petals alternating with four sepals (the latter being hairy), and eight stamens situated opposite to these; the pistil is left in the centre.

ORDER 75. LOPHÍREÆ.

There is only one genus in this order, only one species of which is known, viz., *Lophìra africàna.* This is a fine low-growing tree with terminal corymbs of white flowers, and long entire coriaceous leaves. It is a native of Sierra Leone, where it is called the Scrubby Oak.

Order 76. ONAGRÀRIÆ.—THE EVENING PRIMROSE FAMILY.

This order consists of herbaceous plants or shrubs, many of which are well known and very beautiful, as the different kinds of Evening Primrose (*Œnothèra*), the Fuchsias, the French Willow Herb (*Epilòbium*), and the Enchanter's Nightshade (*Circæa*). They are chiefly natives of the temperate parts of the world, and especially of America: a large number are found in Europe, a good many in India, and some in Africa. The flowers of plants of this order are red, purple, white, blue, or yellow, and axillary or terminal: they may be known by the tube of the calyx generally adhering to the ovary, and by its limb being usually two- or four-lobed, the lobes frequently adhering together; and by the petals, which are twisted in the bud, being either four, or equal in number to the lobes of the calyx, and inserted in the mouth of the tube. The fruit is generally a capsule or a berry with two or four cells containing numerous seeds. The leaves vary considerably, being either alternate or opposite, entire or toothed, and simple, but never compound.

Many of the species of Œnothèra expand their beautiful flowers only in the evening, and hence, being yellow, have been called Evening Primroses. The roots of *Œ. biénnis*, and of some other species, are eatable. There are a great many very beautiful species and varieties of Fúchsia. Several of them bear fruits which are subacid and tolerably good to eat. Several of the species of Clárkia are very pretty annuals.

Order 77. HALORÀGEÆ.

Many of the plants in this order are obscure weeds, as examples of which the following, which are natives of Britain, may be mentioned, viz., the Water Milfoil (*Myriophýllum*), the Water Starwort (*Callítriche*), and the Mare's Tail (*Hippùris*). They are usually found in moist places or ponds in Europe, Japan, China, North America, Southern Africa, and New Holland. Though mostly herbaceous, one (a native of Australia) is a large shrub with corymbs of yellow flowers, viz., *Loudònia aúrea.* The kernels of three species of Tràpa (the Water Caltrops) are eatable. These plants have horned fruit and large seeds. *T. nàtans* (called Marron d'Eau, or Water Chestnut, by the French) is said to have furnished to the ancient Thracians a large part of their food, in the same manner as *T. bispinòsa*, or the Singhara Nut, does at the present day to the inhabitants of Cashmere, and *T. bicórnis* to the Chinese.

ORDER 78. CERATOPHÝLLEÆ.

There is only one genus in this order, viz., Ceratophýllum (the Hornwort), which contains only two species, both natives of Britain, growing in lakes and ditches, and of no known use.

Order 79. LYTHRARIÈÆ, OR SALICÀRIÆ.—THE LOOSESTRIFE FAMILY.

There are a good many very beautiful plants in this order, more particularly those included in the genera Lýthrum and Lagerstrœmia, which may be regarded as the representatives of the order. They are natives of Europe, North and South America, and India. The *Lýthrum Salicària* is a showy British plant with purple flowers, the petals of which (four or six in number) are crumpled in the bud. The stamens are either the same number as the petals, or twice the number; and the capsule is two-celled. The calyx (as in all the plants of this order) is tubular, with numerous lobes. The petals soon fall off. The *Lagerstrœmia índica* (sometimes called the Pride of India) is a shrub with handsome purple flowers. The genus Cùphea contains several very pretty species, the petals of some of which are unequal in size, and curiously inserted in the calyx. *Lawsònia inérmis* is the Henna-plant, with the powdered leaves of which the Egyptian women dye their fingers and feet. The plant is also used for dyeing skins and morocco leather, and for many other purposes. *Heìmia salicifòlia* is a beautiful Mexican stove shrub, with fine spikes of yellow flowers.

Order 80. TAMARISCÍNEÆ.—THE TAMARISK FAMILY.

A small order of shrubs or herbs with twiggy branches, small entire scale-like leaves, which are usually glaucous, and erect terminal spikes of small white or rose-coloured flowers. The species are exclusively confined to the eastern half of the northern hemisphere, that is, to the Old World, on which they extend as far as the Cape de Verds. The principal genus is Támarix, the bark of which is slightly bitter, astringent, and probably tonic. Two species (*T. gállica* and *T. africàna*) are remarkable for the quantity of sulphate of soda which their ashes contain. The Manna of Mount Sinai is produced by *T. mannífera.* Both the French Tamarisk (*T. gállica*) and the German Tamarisk (*Támarix* or *Myricària germánica*) grow extremely well near the sea.

Order 81. MELASTOMÀCEÆ.

This order consists of tropical trees, shrubs, or herbaceous plants, with large handsome (generally purple or white) flowers and leaves, the latter being marked with two or more deep lines running parallel to the midrib. They are nearly related to Myrtàceæ, from which they differ in the want of essential oil, and of the dot-like reservoirs of the leaves which contain it. A slight degree of astringency is the prevailing character of the order, which, though a large one, is entirely destitute of any unwholesome species. The succulent fruit of many is eatable; that of some dyes the mouth black, whence the name of Melástoma. The fruit of *Lasiándra argéntea* and some others is used in Brazil for dyeing black. The juice of *Tocòca guianénsis* is used in Demerara as ink. Several of the species of Lasiándra, Melástoma, and Pleròma have very striking flowers of the richest purple; while *Medinílla magnífica* has large long panicles of delicate pink flowers.

Order 82. ALANGIÈÆ.

This is a small order of large trees and shrubs, the branches of which are often spiny. They are chiefly natives of India. The flowers are produced in fascicles from the axils of the leaves. The fruit is edible. Two species of the genus Alángium are said to afford good wood. The order differs from Myrtàceæ in the petals being more numerous, and in the anthers being adnate, as well as in the fruit being one-celled.

Order 83. PHILADÉLPHEÆ.—THE MOCK ORANGE, OR SYRINGA FAMILY.

These are ornamental shrubs with white flowers, natives of Europe, North America, Japan, and India. The genera best known are Philadélphus and Deùtzia.

Of Philadélphus there are many species, several of which are very effective in gardens when covered with their white fragrant flowers. The flowers of the most common species (*P. coronàrius*) smell like those of the Orange, and the leaves taste like Cucumber. This plant was once considered a tonic, and the oil of its flowers was used for adulterating oil of Jasmine. The two species of Deùtzia best known are *D. scàbra* and *D. grácilis*, both Japanese shrubs, producing an abundance of elegant white flowers.

Order 84. MYRTÀCEÆ.—THE MYRTLE FAMILY.

This order consists of evergreen trees or shrubs, generally bearing white flowers (in some species the flowers are crimson), natives for the most part of hot countries both within and without the tropics. They may easily be distinguished by their entire leaves, which are without stipules, and which, when held up to the light, will be found to be full of transparent dots, with a transparent line running round the margin; and by the flowers, which have numerous stamens on long slender filaments (looking like tufts of silk), and only four or five petals. The whole of the plants are fragrant, the fragrance being due to the presence of an aromatic oil (indicated by the transparent dotting of the leaves and other parts), which gives the principal quality to the produce of the order. To this are due the grateful perfume of the Guava fruit, the powerful aroma of the flower buds of *Caryophýllus aromáticus*, known as Cloves (see figs. 110 and 111), and the balsamic odour of those eastern fruits, the Jamrosade and the Rose Apple. The fruit of the plants of the order varies from a dry capsule to a succulent berry. As examples of the former may be mentioned *Melaleùca Leucadéndron* (the Cajeputi

Tree), from the leaves of which Cajeputi oil (so useful in cases of chronic rheumatism) is obtained; the different species of Eucalýptus (the gum-trees of Australia), one of which (*E. robústa*) contains large cavities in its stem, between the annual concentric circles of wood, filled with a most beautiful red or rich vermilion-coloured gum; Callistèmon; Metrosi-

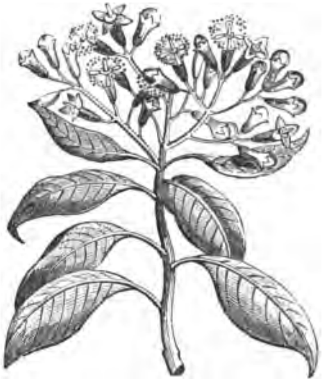


Fig. 110.—Branch of Clove-tree, with flowers and buds.

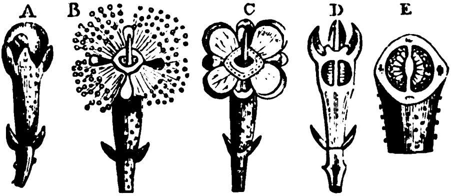


Fig. 111.—Structure of Flowers of Clove-tree. A, bud or clove. B, the flower expanded, showing the stamens in four bundles. C, flower with stamens removed, showing the calyx and corolla, each consisting of four pieces. D, vertical section of ovarium. E, horizontal section of ovarium.

dèros (the heavy, hard, dark-brown timber of a species of which furnishes the South Sea Islanders with their clubs and other weapons); and Leptospérmum (one species of which, *L. scopàrium*, is called the New Zealand Tea). While of those with berry-like fruit, the best known and most interesting are, Psídium (the Guava), Mýrtus (the Myrtle), Caryophýllus (the Clove), *Eugènia Piménta* (the Allspice Tree), *Eugènia Jámbos* (the Rose Apple), and *Eugènia Úgni*. The distilled water of Myrtle flowers is the very agreeable perfume known in France under the name of Eau d'Ange. Two other trees must be mentioned, viz., *Lécythis Ollària* (the Sapucaya Tree), the seeds of which are large and eatable; and *Berthollètia excélsa*, the seeds of which are the well-known Brazil Nuts of the London shops. The fruit of this last plant is large and fleshy, opening with a lid, and containing sixteen or twenty of the triangular seeds or nuts, laid over each other in a regular manner.

Order 85. CUCURBITÀCEÆ.—THE GOURD FAMILY.

These are succulent climbing plants, the fruit of which ministers to many of the wants and comforts of man. They are natives of hot countries in both hemispheres, chiefly within the tropics. Those which are annuals bear very well the climate of northern latitudes during the summer, and hence, although mostly of tropical origin, they are common in European gardens.

In the plants of this order the male and female flowers are generally distinct. The calyx is tubular, and usually five-toothed. The petals, five in number, are generally connected at the base, and have strongly-marked reticulated veins, being sometimes fringed. There are five stamens, four being united so as to form two pairs, the fifth being free. The anthers are two-celled, and generally very long. There are three or five very thick, velvety, two-lobed stigmas. The fruit is fleshy, containing numerous flat seeds. The leaves are usually palmate and very rough. The genera best known are: Cùcumis, which includes the Melon (*C. Mèlo*), the Cucumber (*C. satìvus*), the Water Melon (*C. Citrúllus*), and the Colocynth (*C. Colocýnthis*); Bryònia, one species of which is a well-known British plant (*B. diöíca*, the White Bryony); Momórdica, which contains the Balsam Apple (*M. Balsamìna*), and the Squirting Cucumber (*M. Elatèrium*); and Cucúrbita, containing all the kinds of Pumpkin (*C. Pèpo*), and Vegetable Marrow (*C. ovífera*). While other genera, not so well known, are: Lagenària, the Bottle Gourd (*L. vulgàris* and its varieties); Trichosánthes, the Snake Gourd; and Cárica, the Papaw Tree. This last differs remarkably from the ordinary character of the Cucurbitàceæ, and is by some made into a separate order (*Papayàceæ*). The fruit of the Papaw Tree (*C. Papàya*) is eaten when cooked, but it appears to have little to recommend it. Most commonly it is pickled when about half grown, like the mango, for which it is considered a good substitute.

Order 86. PASSIFLÒREÆ.—THE PASSION FLOWER FAMILY.

Like the last, this order also consists of climbing plants, and they may be easily recognised by their flowers, which are remarkable for the singular arrangement of the stamens and pistil. They are chiefly natives of South America and the West Indies; one or two are found in North America, several in Africa, and a few in the East Indies.

Passiflòra (the Passion-flower), which gives the name to the order (see fig. 112), is the most important genus. If a Passion-flower be examined (see fig. 113), it will be found that it has a calyx of five sepals, which are usually green on the outside, but are yellow, red, blue, or purple, on the inside. There are five petals (of the same colour as the inside of the sepals), which, however, are sometimes wanting. Immediately within the petals are two or more rings of beautiful fleshy threads, or filaments without anthers, called the rays, which are beautifully variegated with crimson or blue and white. The re-

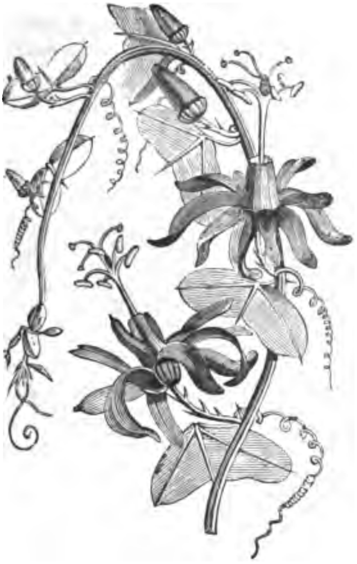


Fig. 112.—Branch of Passion-flower.

threads which surround the column were compared to the crown of thorns!

There are numerous species of Passiflòra, many of which produce flowers of the most striking beauty. The fruit of several species is eatable, as, for example, *P. quadrangulàris* (the great Granadilla), sometimes grown in our hothouses; *P. edùlis; P. malifórmis;* and *P. laurifòlia.* Two or three species of the genus Tacsònia (as *T. manicàta, T. mollíssima,* and *T. pinnatistípula*) also produce very beautiful flowers; and the fruit of *T. mollíssima* is said to be eatable.

Order 87. LOÀSEÆ.

This order consists of succulent cut-leaved herbaceous plants, all natives of America; and most of them are annuals with very showy white or yellow or red flowers. Many of the species (especially those of the genera Loàsa and Caióphora) are covered with glandular hairs or bristles, which sting much worse than those of the nettle.

The flowers of most of the plants included in this order are very curiously constructed, as there are two sets of petals quite distinct in form and colour, and two sets of stamens. The five outer petals are large and hooded, and before each petal there is a bundle of four or more stamens. These petals and stamens are turned back; but there is a second set of five petals (generally blotched with red), which stand erect and enclose a second set of stamens (also erect) which surround the style.

In the genus Blumenbàchia the fruit is roundish, and spirally twisted, and in Caióphora the fruit is horn-shaped, and twisted in a similar manner. This curious construction of the fruit may be seen in *Caióphora punícea,* a well-known climbing annual, which is very generally called *Loàsa aurantìaca* or *L. lateritia*. The fruit of the true kinds of Loàsa is plain, and not twisted, as may be seen in *L. nítida* and *L. Plàcei*, two hardy annuals remarkable for the beauty of their very curious flowers. Another plant that should be mentioned is *Bartònia aúrea*, a very beautiful Californian annual with large golden-yellow flowers.

Order 88. TURNERÀCEÆ.

A small order of suffruticose or herbaceous plants, natives exclusively of the West Indies and South America, with alternate exstipulate leaves, and axillary yellow flowers resembling those of Heliánthemum. The order is chiefly distinguished from Loàseæ by the fruit being superior, and by the stamens being equal in number with the petals, and inserted at the bottom of the calyx, not in the throat of the tube as in that order.

Order 89. PORTULÀCEÆ.—THE PURSLANE FAMILY.

These are succulent shrubs or herbaceous plants, frequenting dry barren situations, or the seashore, in various parts of the world. They are insipid and inodorous, and destitute, so far as is known, of any important medicinal properties. The only species of any known use are the common Purslane of the Greeks (*Portulàca oleràcea*) and *Claytònia perfoliàta*, both of which are occasionally used in salads. The former has, indeed, been used from all antiquity as a potherb, and in salads, on account of its cooling and antiscorbutic qualities.

In all the species of the order the flowers have a distinct calyx (generally of two sepals only), which remains on till the seeds are ripe; and a corolla of five regular petals, which close in the absence of the sun. The stamens are numerous; there is a single style or none; and there are several stigmas, much divided. The capsule is dry and one-celled, and opens naturally when ripe, splitting into three or four valves. The seeds are numerous, and are attached to a central placenta. The remarkably thick fleshy leaves of the plants belonging to this order (of which an example may be seen in the leaves of *Calandrínia díscolor*) serve as a mark by which they may be readily distinguished from other plants having similarly shaped flowers.

The most ornamental plants of the order are contained in the genera Portulàca, Talìnum, Calandrínïa, and Claytònia. The flowers of several of the species of Portulàca and Calandrínia are very beautiful.

Order 90. PARONYCHIÈÆ.

This order chiefly consists of small herbaceous or half-shrubby branching plants, with opposite or alternate, sessile, entire leaves, and small white or greenish-white flowers, which are sometimes axillary and sometimes disposed in terminal cymes. The south of Europe and the north of Africa are the great stations of the order, where the species grow in the most barren places, covering with a thick vegetation soil which is incapable of bearing anything else.

The order differs from Portulàceæ in the stamens being opposite the sepals of the calyx, not alternate with them, and in the number of the sepals.

Two British plants belonging to the order are the Knot-grass (*Illécebrum verticillàtum*) and the Strapwort (*Corrigìola littoràlis*).

Order 91. CRASSULÀCEÆ.—THE HOUSELEEK FAMILY.

These are succulent herbs or small shrubs with fleshy leaves, and beautiful red, orange, yellow, or white flowers. They are natives of all parts of the world, the greatest number being found at the Cape of Good Hope, and of the remainder nearly one-half are European plants. They are found in the driest situations, where not a blade of grass nor a particle of moss can grow, on naked rocks, old walls, sandy hot plains, alternately exposed to the heaviest dews of night and the fiercest rays of the noonday sun. Soil is to them a means of keeping them stationary, rather than a source of nutriment, which in these plants is conveyed by myriads of mouths, invisible to the naked eye but covering all their surface, to the juicy beds of cellular tissue which lie beneath them.

The Common Houseleek (*Sempervìvum tectòrum*) is one of the best known plants of the order. It is a native of Britain, and grows on the tiles of houses, or on walls, where there does not appear to be a particle of earth to nourish the roots. The leaves, however, form a cluster of flat scaly circles, and thus shade and keep moist the roots beneath them. The flowers, which are produced on a tall flower-stem rising from the leaves, are pink, and usually consist of a green calyx, cut into twelve segments, and a corolla of twelve petals, with twelve stamens and twelve carpels, which spread out like a star in the middle of the flower. The number of the petals, however, varies from six to twenty, the other parts of the flower varying similarly, but always agreeing with each other, except as regards the stamens, which are sometimes twice the number of the petals, and arranged in two series, those in one series arriving at maturity earlier than the others. The carpels are equal in number to the petals, and opposite to them; they are arranged in a circle, and are more or less adherent in different species, each having its own style and stigma. At the base of each carpel is a kind of scale or gland; and this is the case with most of the genera in the order. The common houseleek is remarkable for sometimes bearing seeds on its anthers instead of pollen. There are several very ornamental species of Sempervìvum with yellow flowers, natives of the Canary Isles.

Of the other genera belonging to the order, the best known are, Crássula, Kalosánthes, Echevèria, Cotylèdon (the Navelwort), and Sèdum (the Stonecrop).

Order 92. FICOÍDEÆ.—THE FIG-MARIGOLD FAMILY.

Shrubby or herbaceous succulent plants, with opposite simple leaves, and very showy flowers, which only open under the influence of bright sunshine, closing in its absence. Most of them are natives of the hottest sandy plains of the Cape of Good Hope.

The most important genus of the order is Mesembryánthemum (the Fig-marigold), which contains several hundred species, some having yellow flowers, some white, and some pink and other shades of red, many possessing great beauty, especially when seen under bright sunshine. Some of the species are annuals, some are perennials, and others are shrubs. The flowers have a green fleshy tubular calyx of four or five unequal sepals; and a corolla of numerous long narrow petals, closely arranged in two or more rows. The stamens are very numerous, and shorter than the petals. The capsule has four or more cells, each containing numerous seeds. The valves of the capsule open when the seeds are ripe, if the weather should be dry, but remain firmly closed so long as the weather continues wet. This is an obvious interposition for securing the preservation of the race of the Mesembryanthemums; for, as the seeds can only vegetate in a dry soil, if the valves were to open during wet weather, or in wet places, the seeds would fall out and perish. The leaves of all the species are thick and fleshy, and some are of very singular shapes. *M. crystállinum* (the Ice-plant) is remarkable for the abundance of watery pustules with which it is covered. The succulent leaves of a few of the species are eaten, as of *M. edùle*, which is the Hottentot's Fig of the Cape colonists; one species is chewed like tobacco by the Hottentots; others yield an abundance of soda. The *M. crystállinum* (in Spain) and two other species (in Egypt) are collected for the purpose of furnishing alkali for glassworks.

Order 93. CÁCTEÆ, OR OPUNTIÀCEÆ.—THE CACTUS FAMILY, OR INDIAN FIGS.

These are all succulent plants, destitute for the most part of leaves, the place of which is supplied by fleshy stems of the most grotesque form, some being angular, and attaining the height of thirty feet, and others roundish, covered with large stiff spines, like the hedgehog, and not exceeding a few inches in height. The flowers of many are large and remarkably striking, varying from a pure white to rich scarlet and purple, through all the intermediate gradations of colour. Although the plants in this order differ so much in appearance from those of the order Grossularièæ, the characters of both orders are very similar. The species are natives exclusively of America, none appearing to be found wild in any other part of the world. In that country they are abundant in the tropics, extending a short distance beyond them, both to the north and the south. Hot, dry, exposed places are the favourite stations of these plants, for which they are peculiarly adapted, in consequence of the imperfect evaporating pores of their skin; a circumstance which accounts for the excessively succulent state of their tissue. In tropical climates, during a certain portion of the year, a large quantity of rain generally falls, the atmosphere is loaded with moisture for many weeks, and the soil is completely saturated with water. At this time the Cactuses grow very fast, and all the little cavities in their tissue, of which there are countless millions, are filled with liquid nourishment. When the rains cease, and the air again becomes dry, Cactuses are in the most robust health, and their cells are abundantly filled with provision against scarcity. The resistance afforded by their thick cuticle, and by the deficiency of stomata, to the evaporation of this, enables them to retain a store of it (as the camel holds water in the stomach) until they can acquire a fresh supply; and thus they may be truly said to live upon themselves during all those months when they cannot feed upon the soil or the atmosphere. The property thus possessed by the Cactuses, of living where few other plants can exist, sometimes renders them of great utility to man. On Mount Ætna, for instance, and its volcanic fields, it is the Indian Fig (*Opúntia*) which the Sicilians employ to render such desolate regions susceptible of cultivation. This plant readily strikes into the fissures of the lava, and soon, by extending the ramifications of its roots into every crevice of the stone, and bursting the largest blocks asunder by their gradual increase, makes it cápable of being worked.—In the flowers of the plants in this order the calyx and corolla are coloured alike, and confounded together; the stamens are very numerous, with versatile anthers and long filaments; the style is generally a long and slender column; and the stigmas, which vary in number, are either spreading or collected into a head. The ovary is in a cavity within the apparent stalk of the flower, and it becomes an eatable fruit very similar to that of the Gooseberry, but inferior in flavour.

The principal genera of the order are the following: Mammillària, the stems of some of which are cylindrical and others round, and covered with tubercles, disposed in a spiral manner, each being crowned with a little tuft of radiating spines, sometimes mixed with down. The flowers are without stalks, and they are disposed in a kind of zone round the plant Melocáctus (the Melon Thistle), the common species of which (*M. commùnis*) is called also Turk's Cap, has a globose stem with deep furrows, the projecting ribs having tubercles bearing tufts of spines. The stem is crowned with a woolly head, on which the flowers (which resemble those of Mammillària, but are larger) are borne. Echinocáctus (the Sea Urchin Thistle), the species of which have stems resembling those of the different species of Melocáctus, but usually without the woolly head; and the flowers of which proceed from the fascicles or tufts of spines on the projecting ribs. Cèreus (the Torch Thistle), the species of which have angular stems with a woody axis, and tufts of spines on the projecting angles. These have not a woolly head, and the flowers, which are very large and beautiful, either arise from the tufts of spines, or from indentations in the angles. One of the most striking species of this genus is the Night-flowering Cereus (*C. grandiflòrus*), the lovely flowers of which only open at night, and they fade before the morning. These flowers are delightfully fragrant: the rays of the calyx are brown on the outside, and of a bright yellow inside; the petals are of the purest and most dazzling white; and the stamens, which are very numerous and form a kind of tassel in the centre of the flowers, are of a pale yellow colour. A few other species of Cèreus may be mentioned: *C. hexagònus* and *C. peruviànus* (the Peruvian Torch Thistle), the former growing to the height of forty feet in its native country, though the stem is not thicker than a man's arm; *C. flagellifórmis* (the Creeping Cereus), which has slender cylindrical trailing stems and very

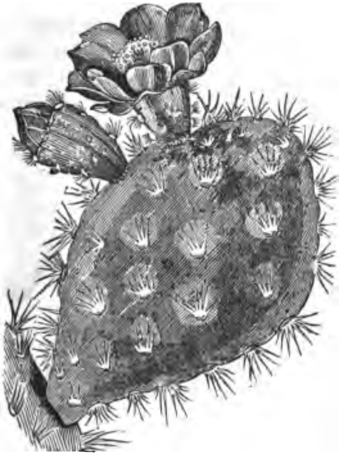


Fig. 114.—Stem, branch, and flower of Opúntia.

numerous pretty pink flowers; and *C. speciosíssimus*, which has an erect, three or four-angled stem, and very large bright crimson flowers, which are purplish inside. The species of Epiphýllum have flat leaf-like stems or branches: *E. speciòsum* has beautiful rose-coloured flowers, and *E. truncàtum* has extremely pretty pink flowers. In the genus Opúntia (the Indian Fig) the stems are either round or flat and jointed, and generally covered with tufts of spines: *O. vulgàris* (the Prickly Pear), the fruit of which is very good to eat, is grown to a great extent in the south of Europe, and also in Brazil, in hedges; *O. Tùna* is also planted in hedges in Spain, South America, and the West Indies, and the fruit, which is also eaten, is of the richest carmine, and forms a valuable pigment, employed at Naples as a water-colour; and *O. cochinillífera* (the Nopal Tree), the species on which Cochineal insects chiefly feed, is very much cultivated in Mexico and South America. In the genus Rhípsalis the stems, which look like Samphire, are slender, cylindrical, and jointed. The last genus to be mentioned is Peréskia, which has leaves like ordinary plants. The two best known

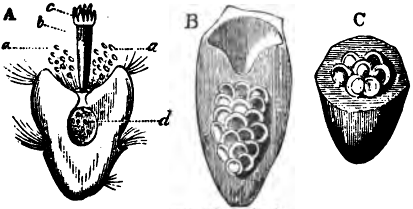


Fig. 115.—Parts of the flower of *Opúntia Tùna*. A, thickened axis, bearing the stamens, *a*; the style, *b*; and stigma, *c*; and enclosing the ovarium, *d*. B, vertical section of ovarium. C, transverse section of ditto.

species are *P. aculeàta* (the Barbadoes Gooseberry), which has white flowers and edible fruit, and *P. Blèo*, the flowers of which are of a beautiful rose colour.

Order 94. GROSSULARIÈÆ.—THE GOOSEBERRY FAMILY.

The plants in this order are distinguished from those in the last by the flowers having a definite number of stamens, and by the woody leafy stems. They are all shrubs, either unarmed or spiny, natives of the mountains, hills, woods, and thickets of the temperate parts of Europe, Asia, and America, but unknown in Africa. In North America they are particularly abundant, and on the mountains of Northern India they contribute to give an European character to that remarkable region. The genus Rìbes contains the Gooseberry and the Currant (both British plants), so well known for their utility and excellence. If the flower of the common Gooseberry (*Rìbes Grossulària*) be examined, the limb of the calyx will be found to consist of five segments (which are turned back), green without and red within. The petals, five in number but small and inconspicuous, are white and erect, and bearded at the base. The stamens are also five in number, and erect; and the anthers burst lengthwise on the inside. The ovary

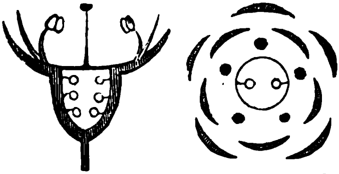


Fig. 116.—Diagram of a flower of Grossularièæ.

is below the cup of the calyx, and the style, which is divided to the base, is always covered with hairs in the Common Gooseberry, and is more or less hairy in the other species of Rìbes. The fruit is a many-seeded berry, with the seeds immersed in pulp; and on cutting open an unripe fruit it will be found that the seeds are each enclosed in an aril, with a separate footstalk, by which they are attached to a membrane lining the sides of the berry, and which is called a parietal placenta. The segments of the calyx remain on the ripe fruit. Besides the Gooseberry, and the Red and Black Currants (*Rìbes rùbrum* and *R. nìgrum*), there are many ornamental species of Rìbes, as, for example, *R. triflòrum*, the flowers of which are white; *R. speciòsum*, which has crimson flowers, with the segments of the calyx not turned back, and long projecting stamens like those of the Fuchsia; *R. multiflòrum*, which has very long drooping racemes of greenish flowers; *R. sanguíneum*, the flowers of which are crimson, and somewhat tubular; *R. aúreum*, which has the flowers of a golden yellow, and quite tubular; and *R. cèreum*, which has roundish leaves covered with white waxy dots on their upper surface, and racemes with few flowers, which are rather large and of a pure white. There is one other genus in the order, viz. Polyósma, which derives its name from the excessive fragrance of its flowers.

Order 95. ESCALLÒNIÆ.

These are all beautiful evergreen shrubs which have often a powerful odour. They are natives of the temperate parts of the world, especially South America. The most important genus of the order is Escallònia, which contains several very ornamental species. The flowers of the different species vary considerably: in *E. rùbra,* they are produced singly, and the corolla, which is red, is tubular, with a short five-cleft limb; in *E. montevidénsis* the flowers, which are white, are not tubular, and they are produced in panicles. In the flowers of both species there are five stamens, and two carpels, the styles of which are combined. The leaves are simple, alternate, and without stipules. Two other very beautiful species are *E. macrántha,* which has terminal panicles of red flowers; and *E. organénsis,* which has rose-coloured flowers, also in terminal panicles. Of the other plants in the order two may be mentioned, viz., *Ìtea virgínica,* a shrub with willow-like leaves, and spikes of white flowers; and *Anópteris glandulòsa,* which has also white flowers.

Order 96. SAXIFRÀGEÆ.—THE SAXIFRAGE FAMILY.

Most of these are small herbaceous plants, usually with white flowers (though some have yellow and others red flowers), the leaves in tufts or patches, and glandular stems. They are natives of mountainous tracts in Europe and the northern parts of the world, frequently forming the chief beauty of that rich turf which is found near the snow in high alpine regions. Some grow on rocks and old walls, and in hedgerows, or near rivulets, or in groves.

In the flowers of plants of this order the calyx generally has five, rarely four, sepals, more or less adherent to each other and to the ovarium. The corolla has five spreading petals (with short claws), which are seldom wanting. There are either five stamens or twice that number. The ovary usually consists of two carpels, diverging at the apex; the partition between these is sometimes complete, forming a two-celled ovary; but occasionally it is absent, when it is one-celled. The styles (which, in the greater number of the family, are only two) are usually distinct, but sometimes they are adherent. Each cell contains a large number of minute ovules. The fruit is generally enclosed in the calyx, and opens only at the point. There is one genus, however, in which there is no adhesion between the calyx and the ovary; and there are several genera in which the adhesion does not extend far up.

The genus Saxífraga is the largest one in the order, and it contains more than twenty British species. One of the best known of these is the London Pride (*Saxífraga* or *Robertsònia umbròsa*), which, though a native of mountainous districts in Yorkshire and in

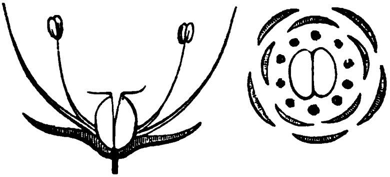


Fig. 117.—Diagram of a flower of Saxifràgeæ.

Ireland, endures the smoke and impure air of London. Of the Golden Saxifrage (Chrysosplènium) there are two British species (*C. alternifòlium* and *C. oppositifòlium*), which are extensively used as salad plants in the Vosges under the name of *Cresson de Roche.* Another genus of the order is the curious and minute Adóxa (the Moschatel), containing only one species (*A. Moschatéllina*), which is also a British plant, growing in obscure places. The only other genus which can be mentioned is Hydrángea, the common garden species of which (*H. horténsis*) has been so long well known. This is a native of China, and its large showy corymbs of pink flowers produce a striking effect. The natural and most common colour of these flowers is pink: in a poor soil they become of a dingy green; but when the plants are grown in richer soil, and watered with an alkaline solution, or manured with wood-ashes, the flowers assume a rich blue tint. Of the Japanese species (*H. japónica*) there is a variety (*H. j. cœrùlea*) which has always blue flowers. The leaves of another species (*H. Thunbérgii*) are dried in Japan and used as a kind of tea, which, from its excellence, is called Tea of Heaven.

Order 97. CUNONIÀCEÆ.

The plants in this order were formerly included in Saxifràgeæ. They are trees or shrubs, most of them having pinnate leaves and small white or pink flowers. They are natives of the Cape, South America, and the East Indies, and common in Australasia. The two genera Callícoma and Baúera, which have simple leaves, are elegant greenhouse shrubs. The bark of a species of Weinmánnia is used in Peru for tanning leather; and it is also used for adulterating the Peruvian bark. *Cunònia capénsis* is a handsome tree, with fine shining green leaves and dense elongated racemes of small milk-white flowers.

Order 98. UMBELLÍFERÆ.—UMBELLIFEROUS PLANTS.

This is a very large order containing numerous important and useful plants, though few possessing any great beauty. Many are most useful as food, and others are most dangerous and poisonous. Of the latter some, under the influence of cultivation, lay aside their poisonous qualities and become wholesome food for man, as, for example, the celery.

The Umbellifers may generally be easily recognised by their hollow stems, and their cut leaves, which have what botanists call a sheathing petiole, that is, a petiole the base of which wraps round the stem; and by their flowers, which are produced in compound umbels, and are mostly white or yellow, sometimes, though rarely, of a pink colour (as in Astrántia, some species of Caúcalis, and others), or blue (as in Erýngium). The fruit is inferior, and, when ripe, separates or may be separated into two grains. They are natives chiefly of the northern parts of the northern hemisphere, inhabiting groves, thickets, plains, marshes, and waste places. In all tropical countries they are extremely rare, except at considerable elevations, where they gradually increase in number as the other parts of the vegetation acquire an extra-tropical, or mountain character. Hence, although they are hardly known in the plains of India, they abound on the mountains of the Himalaya.

Many of the species are culinary plants of great importance, as the Parsnep, the Carrot, the Celery, the Parsley, and the Fennel. The roots of the Carrot, the Parsnep, and other Umbellifers contain sugar. The seeds of some are aromatic and highly stimulating, as Anise, Dill, Caraway, and Coriander; while the fresh leaves and roots of others are narcotic. This has been supposed to arise from the difference in the state of the sap in the different parts of the plant; and it has been thought that the narcotic principle is only to be found in the ascending sap, while the aromatic stimulant properties are found in the juices which are fully elaborated and matured. The Hemlock (*Cònium maculàtum*) is the most poisonous plant of the order; and others not much less so are the Fool's Parsley (*Æthùsa Cynàpium*), the Water Dropwort (*Œnánthe crocàta*), the Water Hemlock (*Phellándrium aquáticum*), the Water Parsnep (*Sìum nodiflòrum*), and the Cowbane (*Cicùta viròsa*). The gum-resin Asafœtida is the milky juice of several species of Férula inhabiting Persia and the neighbouring countries. Galbanum is another gum-resin, owing its origin to *Opoídia galbanífera*, a Persian plant; and Opopanax is the concrete juice of *Opópanax Chirònum*, a plant resembling the Parsnep, and inhabiting the Levant.

The few ornamental plants of the order are contained in the genera Trachymène, Astrántia, Erýngium, Bupleùrum, Angélica, and Heraclèum.

Order 99. ARALIÀCEÆ.—THE IVY FAMILY.

These are trees, shrubs, or herbaceous plants with the habit of Umbellifers, but distinguished from them by their five-celled fruit. There is no beauty in the flowers to recommend them, but the foliage of many is very fine, as, for example, the Ivy, and the species of the genera Sciodaphýllum, Gúnnera, and Aràlia. They are found in the tropical and subtropical regions of all the world; and even in some of the coldest, as in the United States, Canada, the north-west coast of America, and Japan. Similar as these plants are to Umbellifers, they do not appear to possess, to any considerable extent, the dangerous qualities for which some of the latter are remarkable. They are, on the contrary, more generally stimulant and aromatic. The flowers of the common Ivy (*Hédera Hèlix*) are produced in umbels, and they have all their parts in five or ten divisions. The lower leaves, which are smooth and leathery, are five-lobed; while the leaves on the flowering branches, which are always in the upper part of the plant, are entire. The berries (corresponding with the parts of the flowers) are five or ten-celled. The giant or Irish Ivy, the gold and silver leaved, and the golden berried, are all varieties of the common kind. The Ginseng, or Ginschen root (which has a sharp aromatic peculiar taste), so highly prized by the Chinese as a stimulant, belongs to some species of Pànax (? *P. Gínseng* or *P. quinquefòlium*). The celebrated rice-paper of the Chinese is prepared from the pith of *Aràlia papyrífera,* a plant with very fine deeply-lobed leaves. *A. spinòsa,* called the Angelica Tree, is an ornamental low tree with Angelica-like leaves. *Gúnnera scàbra* (or Panke) has remarkably large handsome leaves, the stalks of which are eaten. Mr. Darwin found it growing on the sandstone cliffs of Chiloe, and describes it as somewhat resembling rhubarb on a gigantic scale. He measured a leaf which was nearly eight feet in diameter, and remarked that each plant produced four or five of these enormous leaves, presenting together a noble appearance.

Order 100. CAPRIFOLIÀCEÆ.—THE HONEYSUCKLE FAMILY.

These are beautiful twining or erect shrubs or herbaceous plants, with opposite leaves destitute of stipules, and with white, scarlet, or yellow trumpet-shaped flowers, which are usually in clusters or cymes and often sweet-scented. They are chiefly natives of the northern parts of Europe, Asia, and America, loving cool shady places, but not enduring a very severe climate.

The fragrance and beauty of the honeysuckle (the representative of the order) have been celebrated by the poets of every age; and the plant is a general favourite. What are called the Fly Honeysuckles, which grow erect, are included in the genus Lonícera; while the climbing kinds are called Caprifòlium. Of the upright kinds, the most common is the Tartarian Honeysuckle (*L. tatárica*), the flowers of which are in twins: the corolla is tubular and funnel-shaped, with a five-cleft limb; and there are five stamens, a filiform style, and a capitate stigma. The berries are distinct when young, but they afterwards grow together at the base. The leaves are always distinct. In the genus Caprifòlium, on the other hand, the flowers, which are disposed in whorls, generally spring from the axils of the leaves, and are what are called ringent, that is, they are composed of five petals, four of which grow together, almost to the tip, while the fifth is only attached to the others about half its length, and has the loose part hanging down. (Flowers of this kind, with their lower part forming a tube, and their upper part widely open, are said to be gaping.) In some of the species of this genus the upper leaves are connate, that is, growing together at the base, so that two appear only one leaf, with the stem passing through it. (A single leaf of this kind is called perfoliate, see fig. 15, in page 12.) The Woodbine (*C. Periclýmenum*) is the common honeysuckle of our hedges, and in this the leaves are distinct, and the flowers do not spring from the axils of the leaves but are terminal. In the Trumpet or Evergreen Honeysuckle (*C. sempervìrens*) the flowers are also terminal and are in spikes of three or more whorls; the corolla having a long tube and the lobes of the limb being nearly equal.—Other genera in this order are: Córnus (the Dogwood), the different species of which may be known by the smooth red or reddish-brown bark of their stems and branches; by their white flowers, which are produced either in heads, or umbels, or in corymbose panicles; by their red or blackish berries; and by their coarse feather-nerved leaves. Sambùcus (the Elder), from the juice of the berries of which the well-known Elderberry wine is made, and is frequently used for adulterating port wine. (The Elders are the link between the honeysuckles and the Umbelliferous plants.) Vibúrnum, which contains several well-known plants, as the Laurustinus (*V. Tìnus*), the Guelder Rose (*V. Ópulus*) and the Wayfaring Tree (*V. Lantàna*). Benthàmia, a fine shrub with long tapering leaves, of a light green above and silvery white on the under side, and bright red fruit resembling a large strawberry in appearance, but being rather insipid though not unpleasant. Symphoricárpus, one species of which (*S. racemòsus*) is called the snow-berry (from its clusters of snow-white berries), and bears considerable resemblance to the upright honeysuckles. Weigèla, a very beautiful hardy flowering shrub from China, one species of which (*W. ròsea*) is now very frequently seen in our gardens. Leycestèria, a very handsome shrub with white flowers and very large and showy purple and reddish bracts, and dark purple berries which are nearly as large as a gooseberry. And lastly the rare and pretty Linnæa, of which there is only one species (*L. boreàlis*), an elegant half shrubby evergreen with small bell-shaped flesh-coloured flowers, which are said to be fragrant at night. This is one of our very rare British plants.

Order 101. LORÁNTHEÆ.—THE MISTLETOE FAMILY.

Most of the plants in this order are true parasites, rooting beneath the bark of the trees on which they grow, and deriving from them the whole of their nutriment.

In the flowers of these plants the calyx adheres to the ovary, and scarcely exhibits any trace of division into sepals, the tube being enclosed at its base between two bracts. The corolla consists of three, four, or eight petals, more or less united at the base. The stamens are equal in number to the petals, and are opposite to them: usually the filaments adhere to the petals, but being sometimes absent, the anthers are seated, as it were, upon the latter. There is only one stigma, the style that should support it being sometimes absent. The ovary is one-celled, and contains a single pendulous ovule. The fruit is a berry, containing a viscid matter like bird-lime.

The Common Mistletoe (*Víscum álbum*), a very remarkable parasite, a native of Britain, is the best known plant of the order. Though most commonly found on the Apple-tree, it also grows on the Hawthorn, the Lime, the Cherry, and other trees. The *Loránthus europœus*, a native of Germany, closely resembles the mistletoe, but is generally found on the oak, on which the Mistletoe rarely grows. Of the genus Loránthus there are a great many species, móstly natives of the tropical parts of America and India. Some of these are among the most striking of plants, hanging in clusters of rich scarlet flowers from the branches of trees, which they often clothe with a beauty not their own. Another interesting plant, which is not a parasite, is *Nuýtsia floribúnda*, a beautiful shrub, a native of New Holland, so abundantly covered with very large thyrses of bright orange-coloured flowers, that the colonists at King George's Sound compare it to a tree on fire: hence it has received the name of Fire-tree. The last plant to be mentioned is the well-known *Aúcuba japónica*, though this shrub is now generally considered to belong to the order Cornàceæ, which contains plants formerly included in Caprifoliàceæ, but separated from that order by Dr. Lindley. The Aucuba has the male and female flowers on different plants, and for more than half a century we only possessed the female plant, and consequently the beautiful rich crimson berries were not produced. Within the last few years, however, the male plant has been introduced, and we have now the great gratification of seeing plants of the Aucuba covered with the handsome berries and forming very striking objects either in the conservatory or in the open garden or shrubbery.

Order 102. CHLORÁNTHEÆ.

Inconspicuous herbaceous plants or under-shrubs having an aromatic taste, and producing terminal spikes of greenish flowers, possessing little interest. They are natives of the hot parts of India and South America, the West Indies, and the Society Islands.

Order 103. RUBIÀCEÆ.

This is a large order of trees, shrubs, or herbaceous plants, with simple, entire, opposite or verticillate leaves and intervening stipules. In most of the plants the ovary is surrounded by the calyx, and placed below the rest of the flower: the corolla has a long tube, lined with the dilated receptacle, in which the stamens are inserted, the filaments being very short, and the anthers nearly or entirely hidden in the corolla. In many cases the segments of the calyx remain on the ripe fruit, as they do in the apple and pear, forming what is called the eye.

By far the greater part of the plants of the order are from the hotter parts of the world, especially within the tropics, where they are said to constitute about 1-29th of the whole number of flowering plants. But several of the genera are British weeds. The order contains not only many plants of great beauty, but many which possess important medicinal and other useful qualities. The well-known Peruvian Bark is produced by several species of the genus Cinchòna, of which *C. micrántha* and *C. Condamínea* are the best. The pale bark, by some considered the best, is that of *C. lanceolàta*, the flowers of which are small and of a very pale pink. *C. oblongifòlia*, which yields the red bark of the shops, has cream-coloured flowers, as large as those of the Jasmine, which they resemble in shape; and *C. cordifòlia*, which furnishes the yellow bark, has flowers like *C. lanceolàta*, and heart-shaped leaves. The beautiful and delightfully fragrant *Lucùlia gratíssima* is nearly allied to Cinchòna. The flowers of this plant are produced in a large head, and, to an unpractised eye, they appear to resemble those of the Hydrángea; but they are easily distinguished by their delightful fragrance. The Cape Jasmine (*Gardènia radìcans*) is well known for the fragrance of its white flowers; and there are many other fine species of the genus Gardènia, as *G. flórida*, *G. Fortùnei* and *G. Stanleyàna*. There are also a great many very beautiful plants in the genera Bouvárdia, Burchéllia, Ixòra, Mussǽnda, Rondelètia, Portlándia, and Wendlándia.

The Coffee-tree (*Coffèa arábica*) is one of the most important and useful plants of the order, as its seeds furnish us with that most grateful beverage Coffee. The flowers of the Coffee-tree, which are white, differ from those of the other Rubiàceæ, in the tube of the calyx being very short, and disappearing when the ovary begins to swell; and in the filaments of the stamens being sufficiently long to allow the anthers to be seen above the throat of the corolla. The limb of the corolla is five cleft; and the style is bifid. When the flowers fall, each ovary becomes distended into a berry, or rather drupe, of a deep red colour, containing the nut, in which are two seeds, flat on one side with a deep longitudinal groove, and convex on the other, the flat sides being placed together. These seeds are the coffee in the raw state. The Coffee-tree, which is a native of Arabia, grows erect, with a single stem, to the height of ten feet or more, and has long

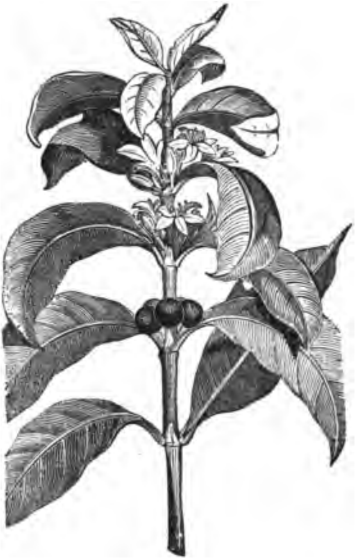


Fig. 118.—Coffee Plant, showing the flowers and berries, and the stipules at the base of the leaves.

slender branches, not unlike those of the bay-tree. The trees begin to produce berries when they are two years old; and in their third year they are in full bearing. The pulp is separated from the berries, after they have been gathered, in various ways. The seeds, before being roasted, are nearly tasteless; but during the process a change takes place, producing the grateful aromatic flavour and odour so well known and so much valued. Coffee was not introduced into Europe until the year 1517; and it was a century and a half before it came into general use. The seeds were at first sold at the exorbitant price of four or five guineas the pound! In 1808 the duty on Coffee was two shillings a pound, and the total quantity consumed in Britain was then little more than one million pounds; but in 1824 the duty was reduced to sixpence a pound, and the consumption has gradually increased to nearly forty million pounds Coffee is supposed to owe its stimulating, refreshing properties to a peculiar chemical principle called Caffeine, which modern chemists pronounce to be the same as Theine. Another very useful plant belonging to this order is that which furnishes the drug called Ipecacuanha, viz., *Cephǎēlis Ipecacuánha*, a little creeping-rooted, half-herbaceous plant, with small white flowers, found in damp shady forests in Brazil. The best brown Ipecacuanha is the powdered root of this plant; but similar properties are found in the roots of other

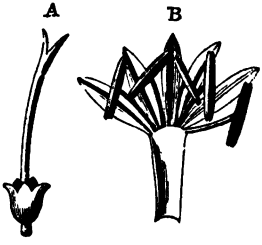


Fig. 119.—Parts of the flower of the Coffee Plant. A, calyx enclosing ovary, with bifid style. B, tube of the corolla cut open, showing the five divisions of its upper part and the five stamens arising from it.

plants of this order, as in *Richardsònia ròsea* and *R. scàbra.* Ipecacuanha is also furnished by the roots of other plants belonging to other orders, as two or three South American species of Vìola, and a species of Euphórbia.

The root of one species of the genus which gives the name to this order, viz., Rùbia (the Madder), furnishes the most important crimson dye, Madder (the principal red dye obtained from the vegetable kingdom). The species is *R. tinctòria,* which is cultivated with success in the South of Europe, though its cultivation does not answer in England. One species of the genus Rùbia (*R. peregrìna*) is a British plant. Other British plants belonging to this order are the several species of Bedstraw (*Gàlium*), the Field Madder (*Sherárdia arvénsis*), and the sweet-scented Woodruff (*Aspérula odoràta*).

Order 104. OPERCULARIÈÆ.

These are exotic weeds, nearly related to Rubiàceæ, the properties of which are unknown. The principal genera are Operculària and Cryptospérmum.

Order 105. VALERIÀNEÆ.—THE VALERIAN FAMILY.

This order (which may be considered a connecting link between Rubiàceæ and Dipsàceæ) consists of annual or perennial herbaceous plants, occasionally twining, and usually either strong-scented or aromatic. They are natives of most temperate climates, sometimes at considerable elevations. They are abundant in the north of India, Europe, and South America, but uncommon in Africa and North America. The genus Valeriàna, which gives the name to the order, contains three or four well-known British species: the Red Valerian (*V. rùbra*), found so abundantly on the steep banks of the chalk pits in the neighbourhood of Greenhithe, in Kent; the Marsh Valerian (*V. diöíca*), frequent in moist boggy meadows; the great Wild Valerian (*V. officinàlis*); and the Heart-leaved Valerian (*V. pyrenàica*). In all the species the corolla is funnel-shaped, with a short tube, and a five-lobed limb. In *V. rùbra* the lower part of the tube is drawn out into a spur, on which account this species is sometimes called the spurred Valerian, and placed in a new genus called Centránthus. The other species of Valerian have the tube of the flower gibbous, that is, much larger on one side than on the other. In all the calyx is tubular, with the limb curiously rolled, so as to form a rim or crown to the fruit. When the flowers drop, the fruit, which is one-celled and one-seeded and adheres closely to the tube of the calyx, begins to swell, and, as it does so, the limb of the calyx gradually unrolls, till at last, when the fruit is ripe, it forms a kind of feathery tuft to waft it away. The flowers of *V. diöíca* are male and female, and are found on different plants. The leaves of the species of this genus vary exceedingly, even on the same plant: those of the Red Valerian are generally lanceolate; those of *V. diöíca* are pinnatifid; those of *V. officinàlis* are pinnate; and those of *V. pyrenàica* are cordate.—The scent of the roots of the Valerian is not agreeable to an European; and yet some are highly esteemed as perfumes. Eastern nations procure from the mountains of Austria the roots of *Valeriàna céltica* and *V. Saliúnca* for perfuming their baths.

Valerianélla (the Corn Salad or Lamb's Lettuce) and Fèdia (the Horn of Plenty) are the principal of the other genera of the order.

Order 106. DIPSÀCEÆ.—THE TEASEL FAMILY.

These are herbaceous plants (nearly allied to Compósitæ), with opposite or whorled leaves, and the flowers growing in heads. The species are chiefly natives of the South of Europe, Barbary, the Levant, and the Cape of Good Hope: they generally shun cold, and are not found at a great elevation above the sea.

The principal genera of the order are *Dípsacus* (the Teasel), Scabiòsa (the Scabious), and the pretty little Knaútia. The species bear considerable resemblance to those included in the order Compósitæ, as they have a head of florets seated on a common receptacle, which is chaffy, and surrounded by an involucre. The florets are also furnished with what may be called a double calyx, the limb of the inner part being cut into long teeth, and resembling the pappus of the Compósitæ. Of the genus Dípsacus, the most important species is the Fullers' Teasel (*D. Fullònum*), in which the receptacle is raised in the form of a cone, and the chaffy scales are hooked, and so strong that the flower-heads, when dry, are used for preparing broadcloth. The florets have a four-cleft corolla, and four distinct stamens; differing in this last point decidedly from the Compósitæ, which have five stamens, the anthers of which are always united into a tube. The leaves of this plant are opposite, and united at their base, so as to form round the stem a hollow in which water collects: hence the plant was called *Dipsakos*, or thirsty, and also obtained the name of Venus's Bath. The water thus collected from rains and dews once had reputation as a cosmetic.—In some of the species of the genus Scabiòsa, the florets of the outer ring resemble those of the ray in the flowers of the Compósitæ. The leaves are as variable as those of the genus Valeriàna, scarcely two species being alike. One species (*S. Succìsa*) has the same kind of flower-head as Dípsacus, but the receptacle is flat, and the involucre much smaller. This is called the Devil's-bit Scabious, from the root appearing as if a part had been bitten off. This plant is said to yield a green dye, and also to be astringent enough to be useful in tanning.

Order 107. CALYCÈREÆ.

These are obscure weedy South American herbaceous plants, with alternate leaves which are without stipules. The order is a very small and curious one, the plants contained in it differing from the Compósitæ in nothing but their albumen, pendulous ovule, and half distinct anthers; and from Dipsàceæ in their filaments being monadelphous and their anthers partly connate.

Order 108. COMPÓSITÆ.—COMPOSITE PLANTS.

This is one of the largest of all the natural orders, containing eight or nine thousand species, which inhabit all parts of the world, and which are herbaceous plants or shrubs, with alternate or opposite leaves, without stipules, usually simple but frequently much divided. All the plants have compound flowers composed of a number of florets, united by a common receptacle, which is surrounded by a calyx-like involucre, giving the whole mass the appearance of a single flower. Each floret has a calyx, the tubular part of which is rarely sufficiently distinct to be perceptible, but the limb is generally cut into long feathery segments called pappus; and this pappus is always on the outside of the corolla, thus plainly indicating its connection with the calyx. In most of the plants the corolla is either ligulate (or strap-shaped), as in the floret of the wild Lettuce (*Lactùca viròsa*), or tubular, as in the floret of the Cotton Thistle (*Onopórdum Acánthium*). All the British Compósitæ have their florets either of one of these kinds, or of the two combined, that is, with the florets of the disk (the centre of the flower) tubular, and those of the ray ligulate; but some foreign genera of the order (which are almost entirely American) have florets with two equal lips, cut into three or four lobes, and are called bilabiate, as in the florets of *Mutísia latifòlia*. There are five stamens, the filaments of which are distinct, but the anthers grow together so as to form a kind of cylinder, through which passes the style, ending in a two-lobed stigma. The ovary of each floret contains only one seed; and the fruit, which is called an achenium (that is, dry and bony), retains the pappus when ripe, and falls without opening.

In so extensive an order as this, to facilitate the study of it, it was necessary to divide it into tribes; and the following four will, perhaps, be the most simple and most easily understood: 1. Cichoràceæ. 2. Cynarocéphalæ. 3. Corymbíferæ; and 4. Labiatiflòræ.

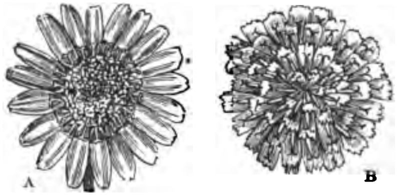


Fig. 120.—Composite Flowers: A, Corymbíferæ; B, Cichoràceæ.

The plants included in the first tribe (*Cichoràceæ*) have ligulate florets, and a milky, narcotic juice; and they bear more or less resemblance to the common Succory (*Cichòrium Íntybus*). If the beautiful large bright blue flowers of this plant (which grows wild in great abundance in many of the sandy and chalky districts of England) be examined, they will be found to consist of a number of florets, all of the kind called ligulate, the upper part being broad and flat, and serrated at the edge. In this genus the pappus is very short, and it is scaly rather than feathery. The leaves of the succory are bitter, and when broken give out a milky juice; and the fleshy roots when roasted furnish the chickory with which coffee is adulterated. The Endive, so much used in salads, is another species of the same genus (*C. Endívia*). The Sow-Thistle (*Sónchus oleràceus*) abounds in the same milky juice as the Succory, and has the same kind of fleshy root. The flower of this plant has a scaly involucre, and a number of ligulate florets, which, when they fall, show the pappus, forming a feathery ball. The common Dandelion (*Leóntodon Taráxacum*), the Lettuce, Salsafy, Ox-tongue, Hawkweed, and many other well-known plants belong to this tribe.

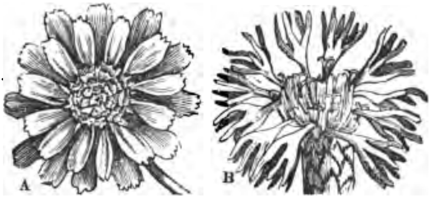


Fig. 121.—Composite Flowers: A, Corymbíferæ; B, Cynarocéphalæ.

The plants contained in the second tribe (*Cynaro-*

céphalœ) have tubular florets, and a watery tonic juice; and they all resemble more or less the common artichoke (*Cýnara Scólymus*). The scales of the involucre are generally fleshy at the base, but terminate outwardly in a sharp hard point. Intermixed with the tubular florets in the receptacle are frequently found the hardened bracts, which in this state are called paleæ, and which appear to be of a chaffy substance, as exemplified in the choke of the Artichoke, the fleshy receptacle being in this plant what is called the Artichoke bottom. All the Thistles belong to this division; and though many of the kinds have not the hardened bracts, they all have a spiny involucre. The pappus of the thistle is generally attached to a kind of disk, from which it becomes loosened soon after the seed falls; and this thistle-down, as it is called, being extremely light, is blown about by the wind. All the Thistles have fleshy roots. The common Bur or Burdock (*Árctium Láppa*), the Corn Blue-bottle (*Centaurèa Cỳanus*), the plant furnishing us with safflower (*Cárthamus tinctòrius*), and many others belong to this tribe.

The plants of the third tribe (*Corymbíferœ*) have one portion of the florets tubular and the other ligulate; a watery juice, in some bitter and tonic, and in others acrid; and the seeds of some of the species yield oil. All the species bear more or less resemblance to the common Daisy. The white florets of this well-known little plant are all ligulate, and compose what is called the ray; and the yellow florets, which form what is called the disk, are tubular. The involucre is simple, and leafy, and the receptacle is conical. The seeds are without pappus. The Chrysánthemum is another well-known genus belonging to this division, the seeds of which are also destitute of pappus. In this plant the involucre is scaly, the scales being strongly marked from being edged with a thin membrane; and the florets of the ray are much longer in proportion to those of the disk than in the Daisy. While in many of the plants belonging to this division the pappus is entirely wanting, in others it assumes a form different to that which is found in plants belonging to the other tribes. For example, in the Bur-Marigold (*Bìdens*) the pappus consists of from two to five erect awns, which are covered with very small bent bristles; and in the genus Senècio the pappus is soft and hairy, as may be seen in the common Groundsel (*S. vulgàris*).

The Great Ox-eye Daisy, the Feverfew, the Pellitory of Spain, the Chamomile, the Yarrow, the Cinerària, the Asters or Michaelmas Daisies, the Golden Rod, the Elecampane, Árnica, the Leopard's Bane, the Dahlia, the Cape Marigold, the Coltsfoot, Wormwood, Southernwood, Tansy, and many other well-known plants belong to this tribe.

The Sun-flower (*Heliánthus ánnuus*) is one of the plants of this division the seeds of which yield oil. In this plant the pappus is awl-shaped, and deciduous; and the receptacle, which is broad and somewhat convex, is paleaceous. The seeds are large and oblong, and when pressed yield a considerable quantity of oil. The tubers of another species of Heliánthus (*H. tuberòsus*) are the Jerusalem Artichokes.

In the plants of the fourth tribe (*Labiatiflòræ*) the florets are bilabiate. These are not so numerous as those of the other tribes, and they are not so generally known. They are, however, well worth examining from the singularity of their formation. *Mutísia latifòlia,* an exceedingly interesting climbing plant, may be taken as an example of this division:

this has a large woolly involucre, the scales of which are of two kinds, the outer ones being pointed and leaf-like, and the inner ones having the appearance of scaly bracts. The florets of the ray are narrow, and spreading in the expanded flower; and those of the disk are shorter, erect, divided into two lips, which curl back, and the lower one of which is again divided into two segments. The leaves of this plant are very curious, from the midrib being lengthened and drawn out into a tendril, and from the petiole being decurrent, that is, prolonged below the point of insertion as if running downwards, as in the leaves of most thistles. Of the other genera belonging to this tribe perhaps the most ornamental is Triptílion, one species of which (*T. spinòsum*) has flowers of the most brilliant blue, that do not lose the intensity of their colour in drying.

Order 109. LOBELIÀCEÆ.—THE LOBELIA FAMILY.

These are very ornamental herbaceous plants or shrubs with an acrid, milky, poisonous juice; alternate leaves, without stipules; and axillary or terminal flowers, which are generally blue, white, or scarlet. The plants at first sight appear to be very different from the Compósitæ, but yet they are very nearly related. They are found abundantly in the West Indies, Brazil, the Himalayan region, the Cape of Good Hope, and the Sandwich Islands; and they are not uncommon in Chili and New Holland.

In the genus Lobèlia (the type of the order) the flowers have the tube of the calyx united to the ovary, with a five-parted limb. The corolla is irregular and tubular, with the tube cleft on the upper side, and thickened at the base. The limb of the corolla is divided into two parts: one, called the upper lip, is cut into two narrow sharp-pointed segments, which stand erect; while the other, called the lower lip, which is much the longer and hangs down, is cut into three rounded segments, There are five stamens, the anthers of which grow together, and at least two of them are bearded. The capsule is oval, two-celled, two-valved, and many-seeded, opening naturally at the top when ripe.—The beautiful little annual *Clintònia pulchélla* belongs to this order, and it differs from Lobèlia in its corolla having scarcely any tube, and, also, but more decidedly, in the very long tube of its calyx. This is so long and slender as to look like a part of the flower stalk, as does the capsule, which, when ripe, is triangular, and is as long as the silique of the cabbage or the wallflower.

Several of the beautiful large scarlet-flowered species of Lobèlia are now placed in the genus Tùpa, in which the segments of the limb of the corolla are united at the tip; the filaments of the stamens cohere as well as the anthers; and the stigma is protruding.

The genus Siphocámpylos contains several very beautiful species.

Order 110. STYLÍDEÆ.

This is a small order of curious little herbaceous plants or undershrubs, which are chiefly found in New Holland. They have pink, white, or violet tubular flowers, ornamented with glittering glands. The stamens are united into a column, which is terminated by a sessile stigma; and this column is so extremely irritable, that, if touched with a pin, it instantly starts from its place with great elasticity. The principal genus is Stylídium. Nothing is known of any use to which the plants are applied.

Order 111. GOODENÒVIÆ.

New Holland herbaceous plants or undershrubs, nearly allied to the Lobeliàceæ, but not having a milky juice. The great peculiarity of the order resides in the stigma, which is very small, seated at the bottom of a cup or covering called an indusium, which is generally found full of pollen. The most interesting genera in the order are Leschenaúltia (several of the species of which are very beautiful), Goodènia, Scǽvola, and Eùthales.

Order 112. CAMPANULÀCEÆ.—THE BELL-FLOWER FAMILY.

These are very beautiful herbaceous plants or undershrubs, with a milky though not poisonous juice, and almost always alternate, simple, or deeply divided leaves without stipules. The species are chiefly natives of the north of Asia, Europe, and North America, and scarcely known in the hot regions of the world. The flowers are single, usually blue or white, very rarely yellow, and they are produced in racèmes, spikes, or panicles, or in heads. The corolla is bell-shaped and regular, consisting of five petals usually grown together, so as to form a monopetalous corolla with five lobes, each lobe having a conspicuous central nerve or vein. There are five or more stamens, which are generally distinct, and which have broad bearded filaments bending over the ovary. The style is at first short, but it gradually elongates itself, and both it and the stigma are furnished with tufts of stiff hairs, which, as the style pushes itself through the stamens, brush off the pollen, and retain it till the stigma is in a proper state to receive it; for the anthers burst as soon as the corolla opens. The capsules have generally two, three, or five cells, and each cell contains many seeds. In the genus Campánula, the capsule opens by little valves, which look as though cut with scissors. Many of the species of Campánula are very beautiful. The roots and young shoots of some species, especially of *Campánula Rapúnculus*, or Rampion, are occasionally eaten. The most interesting genera in the order are Campánula (which is derived from *campana*, a bell, and gives the name to the order), Canarìna, Adenóphora, Wahlenbérgia, Prismatocárpus (Venus's Looking Glass), Röélla, Phyteùma, Trachèlium, and Jasìone.

Order 113. GESNERÀCEÆ.

Soft-wooded, somewhat fleshy, herbacesus plants or shrubs, occasionally having a climbing or creeping manner of growth, and frequently springing from scaly tubers; the leaves being rough or wrinkled, sometimes covered with a soft down, generally opposite or whorled, and without stipules. The flowers are yellow, scarlet, violet, or white, and very showy, and they are generally produced in racemes or panicles. The species are mostly natives of the tropical or warmer parts of America. In the flowers of these plants the corolla is tubular, with a five-cleft limb. There are four stamens, two longer than the others, with the rudiment of a fifth; and the anthers generally adhere in pairs. The fruit is one-celled, and many-seeded.

Many of the species of Gésnera, Achimènes, and Gloxínia are extremely beautiful.

Order 114. VACCINIÈÆ.—THE CRANBERRY FAMILY.

These are elegant small shrubs, chiefly natives of Europe, Asia, and North and South America. The order is nearly allied to Ericàceæ, but it is chiefly distinguished by the inferior fruit, which is a berry.

The best known genera are Vaccínium and Oxycóccus, containing the Whortleberry, the Bilberry, and the Cranberry, all useful fruits.

Order 115. ERICÀCEÆ.—THE HEATH FAMILY.

Very beautiful evergreen shrubs or undershrubs, with rigid, entire, whorled, or opposite leaves, without stipules. They are found most abundantly at the Cape of Good Hope, where immense tracts are covered with them; they are common in Europe and North and South America, both within and without the tropics; less common in Northern Asia and India, and almost unknown in Australasia. In the flowers of plants of this order the calyx is four or five cleft, and the corolla is tubular, with a larger or smaller limb, which is also four or five cleft. The stamens, which grow from beneath the ovary, are definite, and equal in number to the segments of the corolla, or twice as many; the filaments are thick and fleshy; the anthers are two-celled, the cells hard and dry, separate either at the apex or the base, where they are furnished with some kind of appendage, and dehiscing by a pore. The ovary is surrounded at the base by a disk, or secreting scales, and it is many-celled and many-seeded. There is a single style, which is straight; and the stigma is undivided or toothed, or three-cleft, with an indication of an indusium. Fruit capsular, many-celled, with central placentæ: dehiscence various. Seeds indefinite, minute.

The order not only contains all the Heaths (which belong to the genus Erìca), but numerous other important and most beautiful genera, as Rhododéndron, Rhodòra, Azàlea, Kálmia, Lèdum, Árbutus, Arctostáphylos, Gaulthèria, Andrómeda, Clèthra, and Pýrola.

The Rhododendrons and Azaleas differ from the rest of the plants of the order in the irregularity of the corolla, which has unequal divisions, and spreads open at the mouth; and the stamens are bent towards one side. The Kálmia is remarkable for the manner in which the stamens are held down by the corolla until the pollen is ready to be shed. The corolla is salver-shaped, and on the under side of the limb are ten protuberances, producing as many hollows on the upper side, in which lie half buried the ten stamens. In these little niches the stamens are held until the complete expansion of the flower, when they rise up with a spring, scattering the pollen on the stigma. This singular construction gives the corolla that wrinkled appearance which has procured for the plant its American name of Calico flower.

Some of the species of the order are possessed of narcotic qualities, as *Rhododéndron chrysánthum;* and it is said that honey obtained from the flowers of *Azàlea póntica* is poisonous. It is also said that the flesh of birds which have fed on the buds of the Kálmia is injurious. The berries of the Árbutus (which is called the Strawberry-tree) are eatable, and from them an agreeable wine is said to be prepared in Corsica.

Order 116. PENÆÀCEÆ.

These are beautiful evergreen shrubs, natives of the Cape of Good Hope, with the habit of Pimelèa, and with corymbs of elegant pale pink flowers. The calyx has two sepals; the stigma is four-lobed; and the fruit is four-valved, with two seeds in each cell.

Subclass 3. COROLLIFLÒRÆ.—*Petals cohering in the form of a hypogynous corolla, which is not attached to the calyx.*

To this subclass are referred all genera which have a monopetalous corolla, with the stamens inserted into it, and a superior ovarium.

Order 117. EPACRÍDEÆ.—THE EPACRIS FAMILY.

Elegant shrubs, natives of New Holland (where they abound as Heaths do at the Cape of Good Hope), of a dry, hard, prickly habit. The flowers are tubular, or campanulate, with a five-cleft limb, and will divide readily into five petals, each of which has the filament of a stamen attached to it, leaving only the anthers free. The anthers are one-celled and awnless, and this is the principal distinction between this order and Ericàceæ. The calyx is five-cleft, coloured like the corolla, and there are five scale-like bracts below it, which look like a calyx. The capsule of Épacris is dry, with the seeds attached to a central column.

The species are chiefly remarkable for the great beauty of their flowers, and the singular structure of their leaves, which have veins similar to those found in the leaves of Endogens. The best known genus of the order is Épacris. The fruit of some of the genera is eatable. *Astrolòma humifùsum* (the Tasmanian Cranberry) has a green or whitish fruit, sometimes slightly red, about the size of a black currant, with apple-flavoured pulp. This fruit grows singly on the trailing stems of the plant, which has the appearance of the Juniper, bearing beautiful scarlet blossoms in winter.

Order 118. SYMPLOCÍNEÆ.

Shrubs with serrated leaves, turning yellow in drying, and small white flowers, which are sometimes fragrant. The leaves of most of them are astringent: those of *Sýmplocos tinctòria* are used in America, under the name of Sweet-leaf, for dyeing yellow.

Order 119. STYRACÍNEÆ.—THE STORAX FAMILY.

These are elegant trees with white flowers, chiefly natives of North America. The two genera best known are Stỳrax (the Storax), and Halèsia (the Snowdrop Tree). *Stỳrax officinàle* furnishes the gum called Storax, which issues from incisions made in the bark. In the flowers of this plant, the corolla is funnel-shaped, with a five-cleft limb; there are ten stamens, growing together at the base, with short filaments, and very long anthers. The fruit is a drupe, which is nearly dry, containing a one-celled nut, enclosing from one to three seeds. The seeds have two skins, the inner one like a cobweb, and the outer one spongy. The Halèsia has drooping bell-shaped white flowers, something like those of the Snowdrop, with a four-cleft corolla, and twelve or sixteen stamens combined into a tube at the base. The fruit is a dry winged drupe, which has four angles in *H. tetráptera,* and two in *H. díptera,* and which contains a stone or putamen, having two or four cells and as many seeds.

Order 120. MYRSÍNEÆ.

These are showy evergreen shrubs with alternate undivided leaves, and cymes of white or red flowers. They are found in the hot parts of Asia, Africa, and

America: in Europe they are entirely wanting. The plants of this order may be easily known on cutting open their flowers, as among stove plants they are the only ones having monopetalous flowers that have the stamens opposite the lobes of the corolla, the general position of the stamens being between the lobes. The two best known genera of the order are Mýrsine (the species of which are greenhouse shrubs) and Ardísia (the species of which are well-known stove shrubs, with white or red flowers and red berries); while Theophrásta, Clavìja, and Jacquínia are other genera not so well known.

Order 121. SAPÒTEÆ.—THE SAPODILLA FAMILY.

Trees or shrubs (mostly evergreen), often abounding in milky juice, which is not acrid and poisonous like that of most other plants which have a milky juice, but, on the contrary, wholesome as food. They are chiefly natives of the tropics of India, Africa, and America; a few being found in the southern parts of North America, and at the Cape of Good Hope. The species are chiefly valuable for their fruit, which, in many cases, contributes richly to the dessert: among these are *Mimùsops Eléngi, Imbricària malabárica, Àchras Sapòta* (the Sapodilla plum), *Àchras mammòsa* (the Marmalade), and other species, *Chrysophýllum Cainìto* (the Star Apple of the West Indies), and other species. The seeds of all the plants of the order are oily: the oil is not fluid, but so concrete as to have the appearance and consistence of butter, whence the name of butter-tree has been applied to different species both in Africa and India. The most remarkable of these is the Indian Mahva or Madhuca-tree (*Bássia butyràcea*). Another important and interesting plant belonging to this order is *Isonándra Gútta*, which yields Gutta Percha.

Order 122. EBENÀCEÆ.—THE EBONY FAMILY.

This order consists of trees or shrubs, without milk, and with heavy wood. Some are hardy, with deciduous leaves and white flowers, natives of woods, mountains, and the banks of streams in North America, Europe, and New Holland: others are tropical evergreens. The principal genus is Diospy̆ros, which contains the Ebony-tree (*D. Ébenum*), the common Date Plum, or European Lotus Tree (*D. Lòtus*), and the Virginian Date Plum or Persimon (*D. virginiàna*). The flowers are inconspicuous, and the fruit, which is eatable, is a berry, placed in the centre of the calyx, which spreads round it like a saucer. When first gathered the fruit is very harsh, and, like the Medlar, requires to be kept till it is softened by the action of frost before it is eaten.

Order 123. BREXIÈÆ.

The place of this order in the Natural System is extremely doubtful. The genus Bréxia (found in Madagascar) contains fine trees with the habit of Theophrásta, and having large leaves, and axillary bunches of greenish-white flowers.

Order 124. OLÈINÆ.—THE OLIVE FAMILY.

This order contains many well-known trees and shrubs, which were formerly combined with the Jasmines, such as the Common Ash, the Manna Ash, the Olive, the Privet, the Fringe Tree, the Phillyrea, and the Lilac. They have all simple, opposite leaves, which are sometimes pinnated; and the flowers are produced in terminal or axillary racemes or panicles. In nearly all, the flowers have only two stamens which alternate with the segments of the corolla, and a roundish two-celled ovary, without any disk. The flowers of the Ash have no corolla, and the fruit is a samara. In the other genera, the flowers are more or less funnel-shaped, and the fruit is a capsule. The seeds have dense fleshy albumen.

The Ash (*Fráxinus excélsior*) differs so much from the other genera as to seem hardly to belong to the same order. The flowers are without any petals, and frequently without any calyx: some of them have no

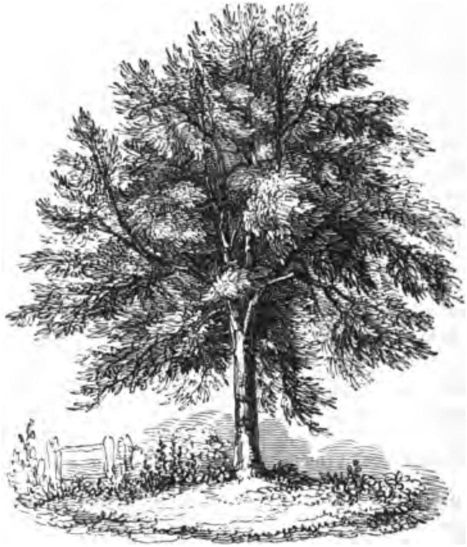


Fig. 122.—The Ash-tree.

stamens, and others have no pistil; while some have both stamens and pistil.

The Manna, or flowering Ash (*Órnus europǽa*), differs very much from the Common Ash in its flowers, which are white, with the corolla divided into four long narrow segments. The two stamens have long filaments; the pistil is small, the stigma being notched. The tree is very ornamental from the profusion of flowers, which are produced in loose panicles. The samaras and leaves closely resemble those of the common Ash. The Manna is the sap of the tree, procured by wounding the bark.—The Olive (*Òlea europǽa*) has small white flowers, resembling those of the Privet; and the fruit is a fleshy drupe, with a one or two-celled stone or nut. The best olive oil is obtained (by pressure) from the pulp of the fruit. The flowers and leaves of one species of the genus (*O. fràgrans*) are very fragrant, on which account the plant is much esteemed in China; and the leaves are used both to adulterate and flavour tea.—The Fringe Tree (*Chionánthus virgínica*) has the segments of the limb of its corolla cut into long slender shreds like fringe. This plant is closely allied to the Olive, though the fruit does not contain oil.

The Lilac (*Syrínga*), the Phillýrea, and the Privet (*Ligústrum*), are well-known shrubs, all very useful in gardens, especially the different kinds of Lilac.

Order 125. JASMÍNEÆ.—THE JASMINE FAMILY.

These are shrubs, often having twining stems. They are chiefly inhabitants of tropical India, in all parts of which they abound; while a few are found in South America, Africa, and New Holland, and two in Europe. The plants of the order are chiefly distinguished from the Olèinæ by their ovules being erect, instead of pendulous as in that order, and by their seeds having very little or no albumen. The principal genus is Jasmìnum, the species of which have a funnel-shaped corolla, and the petioles of the leaves articulated or jointed, that is, they will break off the stem without tearing the bark. Fragrance is the predominant property of the Jasmine, and has made it for ages an especial favourite. This delicious fragrance arises from the presence of an oil, which can be extracted so as to retain its perfume. The genuine essential oil of Jasmine of the shops is obtained from the flowers of *Jasmìnum officinàle* and *J. grandiflòrum;* but a similar perfume is also procured from *J. Sámbac.* In the East Indies the tube of the corolla of *Nyctánthes Árbor trístis* (the Tree of Sadness) is used as an orange dye. This plant (the Hursinghar of India) scents the gardens with its delicious perfume only during the night, covering the ground in the morning with its short-lived flowers, which, being collected like those of the Chumbelee (*Jasmìnum grandiflòrum*), are strung on threads and worn as necklaces, or entwined in the hair of the native women.

Order 126. STRÝCHNEÆ.

Tropical trees, nearly allied to the Apocýneæ, and like them truly poisonous. It would be difficult, indeed, to name a more poisonous order than this, of whose qualities the celebrated Núx-vómica may be taken as an example. This fatal drug consists of the seeds of *Strýchnos Núx-vómica* (or Poison Nut), an Indian tree, with small greenish-white flowers, and a beautiful orange-coloured round fruit, the size of a small apple, having a brittle shell, and a white gelatinous pulp. The seeds are extremely poisonous, in large doses producing extraordinary rigidity and convulsive contraction of the muscles previous to death. The pulp of the fruit seems perfectly innocent, as it is greedily eaten by many sorts of birds. Strychnine, obtained from S. Núx-vómica, is now much employed medicinally in this country. Another virulent species is the *Strýchnos toxífera,* which forms the basis of the celebrated Wooraly or Ourari poison. The ripe seeds of *S. potatòrum* (the Clearing Nut), are dried and sold in every market of the East Indies for clearing muddy water. The pulp of the fruit when ripe is eaten by the natives.

Order 127. APOCÝNEÆ.—THE DOG'S-BANE FAMILY.

Very showy trees or shrubs (some being climbers), usually with acrid milky juice, readily known by the twisted direction of the segments of the corolla, which have been compared to the rays of a St. Catherine's wheel. By far the greater part of the species are tropical, a few representatives only (such as Vínca and Apócynum) being found in northern countries.

The corolla is generally salver-shaped, as in the Periwinkle (Vínca), or funnel-shaped, as in Tabernæmontàna and Allamánda, or divided into equal segments, as in *Nèrium Oleánder* (the Oleander). The flowers are often bearded in the throat, and furnished with hypogynous scales. The stamens are enclosed in the flower, the anthers lying close together. The seed is contained in two follicles, which are slender, with the seeds disposed in two rows.

Although some of the plants of the order are used medicinally, and others have an eatable fruit, many of them are poisonous, two of the most virulent being the genera Cérbera and Tanghínia. Even the beautiful Oleander is a formidable poison, for a few years ago a child died from having eaten, one morning, a quantity of the flowers of this plant.

The best known genera of the order are Vínca, Allamánda, Nèrium, Diplадènia, Echìtes, and Mandevílla.

Order 128. ASCLEPIÀDEÆ.

Shrubs, or occasionally herbaceous plants, often twining, and nearly all having a milky juice. The species differ from those of the last order in having the corolla straight, in the stamens being united into a sort of fleshy crown, and in the pollen being found in masses of a waxy substance. The seeds are also each furnished with a tuft of long silky hair. Africa is the great field of Asclepiads, especially the southern point. In tropical India and New Holland, and in all the equinoctial parts of America, they also abound. It is singular that in an order of plants so generally poisonous as these are, the young shoots of some species should be an article of food, as, for example, *Pergulària edùlis, Oxystélma esculénta,* and several others.

The principal genera are Períploca (one species of which is a hardy shrub), Hoŷa (which has wax-like clusters of odoriferous flowers distilling honey), Pergulària (remarkable for the fragrance of its flowers), Physiánthus, Gonólobus, Ceropègia, Asclèpias, and Stapèlia (the species of which are succulent plants without leaves, and with strangely coloured and spotted flowers, large in proportion to the plants, and often smelling very disagreeably).

Order 129. GENTIÀNEÆ.—THE GENTIAN FAMILY.

Herbaceous plants, seldom shrubs, generally smooth, sometimes twining. The order is very nearly allied to Apocýneæ. The species are found in almost all parts of the world, from the regions of perpetual snow upon the summits of the mountains of Europe, to the hottest sands of South America and India. The flowers have a tubular calyx and corolla, the latter plaited in the tube, and with an equally-parted limb, which is generally five-cleft; and an equal number of stamens with broad filaments and arrow-shaped anthers. The seeds are numerous and are usually in two follicles.

All the plants are pretty, and many are extremely beautiful. Gentiàna (the Gentian) is the most common genus, most of the species of which have deep-blue flowers. The medicinal properties of the roots of *Gentiàna lùtea, G. punctàta,* and *G. purpùrea* are eminently tonic and stomachic; and similar, though more feeble, virtues are found in most of the plants of the order.

Of the other genera the best known are Chlòra, Erythræ̀a, Chirònia, Spigèlia, Lisiánthus, Villársia, and Menyánthes (the Buck bean).

Order 130. BIGNONIÀCEÆ.—THE TRUMPET-FLOWER FAMILY.

Trees, shrubs, or herbaceous plants, often twining or climbing, with showy trumpet-shaped flowers, and broad pinnated leaves. Mostly found in the equinoctial regions, a few only passing beyond those limits to the north. All the plants of the order have winged seeds, and generally very long horn-like seed-pods. The best known genera are Catálpa, Bignònia, Técoma, Jacaránda, Eccremocárpus, and Streptocárpus. The *Bignònia radìcans* is a hardy climbing plant of great beauty; and the *Eccremocárpus scàber* is a very pretty climbing plant which will endure the open air in the summer. The *Catálpa syringifòlia* is a very fine hardy tree with handsome heart-shaped leaves and delicate white flowers. Some of the species of Jacaránda have very beautiful blue or purple flowers, and elegant leaves.

Order 131. COBÆÀCEÆ.

This order consists of the genus Cobæa, of which one species (*C. scándens*), a native of Mexico, is common in our gardens, producing its showy bell-shaped flowers (which are at first green, and afterwards become purple) in great profusion.

Order 132. PEDALÍNEÆ.

Herbaceous plants, formerly included in Bignoniàceæ, from which they are distinguished by the small number of wingless seeds in each cell of the fruit. The only genus is Pedàlium.

Order 133. SESÀMEÆ.

These are annual plants, natives of the tropics, with showy trumpet-shaped flowers, simple leaves, and very curious seed-pods. The most interesting genus is Martýnia, one species of which (*M. fràgrans*) is fragrant. The seeds of Sésamum abound in oil (which is easily expressed), for which the common species is extensively cultivated in hot countries.

Order 134. POLEMONIÀCEÆ.

Herbaceous plants, with very showy blue, red, or white flowers, and often with pinnated leaves. They are natives of cool or mountainous parts in Europe and America. The genus Polemònium (the Greek Valerian) has one species (P. cærùleum) which is found wild in some parts of England, and is known by the names of Charity and Jacob's Ladder. In the flower of this plant, the corolla, which is of a deep blue softening into white in the centre, is rotate, with the stamens, which are bearded at the base, inserted in the throat. The capsule is three-celled, and many-seeded, as is generally the case with plants in this order. The different species of Phlóx are very handsome. Leptosìphon, Gílìa, and Collòmia are beautiful annuals.

Order 135. HYDROLEÀCEÆ.

Elegant little plants with blue flowers, chiefly distinguished from Convolvulàceæ and Polemoniàceæ by the flowers having two styles, and by the capsules being two-valved. The roots of *Hydròlea spinòsa,* a very pretty South American plant, are bitter.

Order 136. CONVOLVULÀCEÆ.—THE BINDWEED FAMILY.

Nearly the whole of these are twining plants, with showy flowers expanding beneath the influence of bright sunshine. A few are shrubs, but the greater part are herbaceous, and very many are annuals. Some are weeds, which are very troublesome, and, from their creeping roots, are difficult to extirpate, as, for example, the common bindweed. They are very abundant in all parts of the tropics, but rare in cold climates, where a few only are found. The plaited corolla, imbricated calyx, and climbing habit, are the distinguishing marks of this order. The roots of many of the plants abound in a milky acrid juice. Scammony, jalap, and some other drugs are the produce of plants of this order. Scammony is exclusively furnished by *Convólvulus Scammònia*, a Syrian perennial. The best sort of Jalap is obtained from *Exogònium Púrga*. The roots of *Batàtas edùlis* (the sweet Potato), and others are useful articles of food.

The most interesting and best known genera are Convólvulus, Calystègia, Ipomœa, Quamóclit, Pharbìtis, and Argyreìa. The singular parasite the Dodder (Cúscuta) also belongs to this order. There are two British species of Dodder, one of which, the greater Dodder (*C. europæa*), sometimes proves highly injurious to the fodder crops of the farmer.

Order 137. Boragíneæ.—The Borage Family.

These are chiefly herbaceous plants, with alternate exstipulate leaves, the surface of which is covered over with minute asperities consisting of hairs; and with flowers arranged in one-sided spikes or racemes, occasionally solitary. The corolla is generally salver or funnel-shaped, with a five-lobed limb, and five little scales just within the throat. There are five anthers, which seem attached to the corolla; and a slender style terminating in a two-lobed stigma. The calyx is tubular, and remains on till the fruit is ripe; the teeth of the calyx contracting at the point so as to cover the ripe carpels. Each flower has also four distinct little nuts or seeds, as they are commonly called. These nuts frequently appear as though a hole had been bored in them at the base; and they are sometimes striped or twisted. The species are found abundantly in all the southern parts of Europe, the Levant, and Middle Asia; less frequently as we approach the arctic circle, and almost disappearing within the tropics. In North America they are less abundant than in Europe. The flowers of many of the species are very beautiful. The roots of several of the plants afford a red colour, which is useful in dyeing. The principal genera are Heliotròpium (the Heliotrope), Lithospérmum (the Gromwell), Pulmonària (the Lungwort), Sýmphytum (the Comfrey), Cerínthe (the Honey wort), Èchium (Viper's Bugloss), Asperùgo (German Madwort), Anchùsa (Bugloss), Myosòtis (the Scorpion-grass), one species of which (*M. palústris*) is the Forget-me-not, Omphalòdes (Venus's Navel wort), Cynoglóssum (the Hound's Tongue), and Boràgo (the Borage).

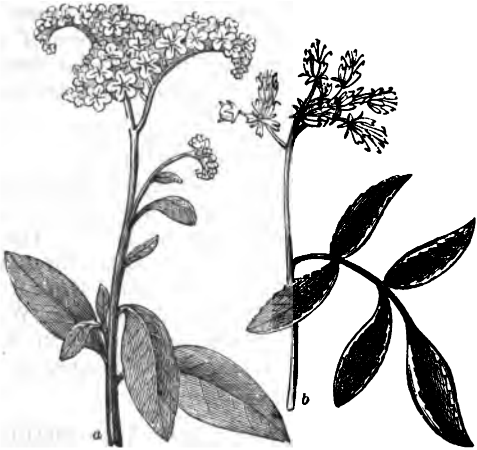


Fig. 123.—*a*, Heliotrope; *b*, Water-leaf (*Hydrophýllum*).

Order 138. CORDIÀCEÆ.

This order contains trees which were formerly referred to Boragíneæ, from which their habit, plaited cotyledons, and dichotomous style divide them. Little is known of their properties except that the flesh of their fruit is succulent, mucilaginous, and emollient. The smell of their nuts when cut is heavy and disagreeable, the taste of the kernels like that of fresh filberts. The nuts of *Córdia Sebestèna* are sometimes used medicinally. The species are, for the most part, natives of the tropics of both hemispheres. A few occur in the cooler parts of South America. The best known genera are Córdia and Ehrètia.

Order 139. HYDROPHÝLLEÆ.

These are elegant herbaceous plants, chiefly natives of North America, most of them having blue, white, or pink flowers, and pinnate parted leaves. Three of the genera contain some of the most beautiful of the Californian Annuals, viz., Phacèlia, Eùtoca, and Nemóphila. The species of Hydrophýllum (Water-leaf) are perennials, growing in marshes in North America, where one species (*H. virgínicum*) is used as a salad.

Order 140. SOLÀNEÆ.—THE NIGHTSHADE FAMILY.

The baneful nightshade represents this order, which participates very generally in its qualities, although they are frequently hidden beneath a fairer form, and often much mitigated. The species are herbaceous plants or shrubs, natives of most parts of the world without the arctic and antarctic circles, especially within the tropics. The number of species of the genus Solànum is very great in tropical America. In the flowers of these plants the calyx is tubular, with five equal teeth, remaining on till the fruit is ripe; the monopetalous corolla has a five-cleft limb; and the five equal stamens are inserted upon the corolla. The fruit is generally round and fleshy, with two or four cells and numerous seeds.

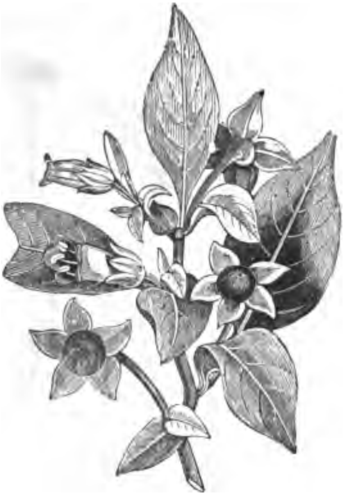


Fig. 124.—Branch of Átropa Belladónna, or Deadly Nightshade, with buds, flowers, and fruit.

The usual effect of the Solàneæ is narcotic: the leaves of all are, in fact, narcotic and exciting, but in different degrees, from *Átropa Belladónna* (which causes vertigo, convulsions, and vomiting), Tobacco (which will frequently produce the first and last of these symptoms), Henbane, and Stramònium, down to some Solanums (the leaves of which are used as kitchen herbs). Some of the most deadly of the poisonous species likely to be met with in this country are: the Thorn Apple (*Datùra Stramònium*); the Henbane (*Hyoscỳamus nìger*); the Deadly Nightshade (*Átropa Belladónna*), every part of which is poisonous; the Mandrake (*Mandrágora officinàlis*), by the best commentators regarded as the Dudaim of Scripture; Tobacco (*Nicotiàna Tabàcum*); and the Bittersweet (*Solànum Dulcamàra*). An extract of the leaves of the common Potato (*Solànum tuberòsum*) is a powerful narcotic, ranking between Belladónna and Cònium. Some few of the plants afford tonics; the Cápsicum furnishes the well-known condiment called Cayenne Pepper; and others are most important articles of food or cookery, as the tubers of the Potato, Tomatoes (the fruit of the *Lycopérsicum esculéntum*, commonly called Love Apples), and Egg Apples (the produce of *Solànum Melongèna*), also called Brinjals or Aubergines.

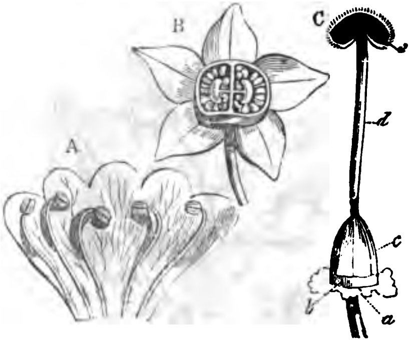


Fig. 125.—Parts of flower of Átropa Belladónna, or Deadly Nightshade. A, corolla cut open, showing the stamens inserted on it. B, calyx, with ovarium cut across. C, pistil, with *a*, origin of calyx; *b*, origin of corolla; *c*, ovarium; *d*, style; and *e*, stigma.

Many very beautiful species are contained in the genera Datùra, Brugmánsia, Schizánthus, Salpiglóssis, Browállia, Petùnia, Nierembérgia, Lýcium, Céstrum, Habrothámnus, Meyènia, Fabiàna, Solándra, Brunsfélsia, and Francíscea.

Order 141. SCROPHULARÍNEÆ.—THE FIGWORT FAMILY.

The species are generally herbaceous plants, very rarely shrubs, with opposite, whorled, or alternate leaves; and natives of mountains, valleys, ditches, woods, and waysides, in all parts of the world, from the coldest regions to the hottest places within the tropics.

The Foxglove is generally taken as the type of the order. This has a tubular corolla, with a short limb, and a spreading calyx. There are four stamens of unequal length inserted on the base of the corolla and hidden in its tube; and an oblong ovary, with a long style, and a two-lobed stigma. The fruit is a dry capsule with two cells, and numerous seeds. The flowers of the other genera are very irregular: in the Snapdragon (Antirrhìnum) the corolla is what is called personate; and in the Calceolària the lower lip is curiously inflated. The stamens also differ: in most of the genera there are four, but in Pentstèmon there is a fifth, long and slender, and hairy at the point, but without any anther; and in Calceolària and Verónica there are only two.

Most of the species of the order have an unpleasant smell, a bitterish taste, and acrid and suspicious properties. Some, however, are sweet and aromatic. Some are useful medicinally, as Scrophulària and Digitàlis. The best known genera are Búddlea, Maurándya, Lophospérmum, Rhodochìton, Antirrhìnum, Linària, Paulównia, Scrophulària, Digitàlis, Pentstèmon, Chelòne, Torènia, Mímulus, Alonsòa, Euphràsia, Bártsia, Rhinánthus, Melampỳrum, Pediculàris, Collínsia, Calceolària, and Verónica.

Order 142. LABIÀTÆ.—THE LABIATE FAMILY.

These are herbaceous plants or undershrubs, mostly natives of extra-tropical countries, although some are found in the hottest parts of the world. Many have extremely odoriferous leaves, as Mint, Sage, Thyme, and other kitchen aromatic plants; and some bear handsome flowers, which, in some of the plants, are disposed in a whorl round the stem, as is the case with the Dead Nettle (Làmium). The flowers are distinguished by a tubular, bilabiate corolla, with a projecting under lip. In some of the plants the corolla is ringent. There are four stamens, two of which are longer than the others; and the cells of the anthers differ from those of most other plants in spreading widely apart from each other, each being joined to the filament only at the tip. The pistil consists of four distinct carpels, a very long style lobed at the tip, and furnished with a very small stigma at the tip of each lobe. The plants are all remarkable for their tonic, cordial, and stomachic virtues: they contain both a bitter and an aromatic principle, in different proportions. The bitterness, which is given out in decoctions, resides in a gum-resinous secretion, abounding in some species which are used as stomachics; and the aromatic principle is due to the presence of an essential oil in which some abound which are used as stimulants. From the different degree of combination of these principles in different plants, they have obtained various uses, some being used for seasoning food, and others for perfumes. The essential oil of all contains camphor, which exists in some quantity in rosemary, sage, and lavender.

Some of the most common and best known genera are, Méntha (the Mint), Perílla, Thȳmus (the Thyme), Oríganum (the Marjoram), Hyssòpus (the Hyssop), Teùcrium (the Germander), Ájuga (the Bugle), Rosmarìnus (the Rosemary), Làmium (the Dead Nettle), Glechòma (the Ground Ivy), Marrùbium (the Horehound), Lavándula (the Lavender), Melíssa (the Balm), Prunélla (the Self-heal), Sálvia (the Sage), Còleus (of which several kinds with very beautifully variegated leaves are now common in our gardens), Plectránthus, and Pogostèmon (one species of which furnishes the celebrated Patchouli, or Puchá pát).

Order 143. VERBENÀCEÆ.—THE VERVAIN FAMILY.

This order contains showy herbaceous plants, handsome shrubs, and lofty timber trees. The species are natives of Europe, Northern Asia, and North America; common in the tropics of both hemispheres, and in the temperate districts of South America.

In the genus Verbèna the calyx is tubular, with five distinct angles, ending in five teeth. The corolla has a cylindrical tube nearly double the length of the calyx, and a flat limb divided into five unequal segments, which are wedge-shaped and notched, the central one of the lower three appearing to have been slightly pinched: the throat of the corolla is hairy. There are four stamens, two longer than the others, the anthers having two widely-spreading lobes, as in the Labiàtæ. The style is slender below, and thickest in the upper part, and the stigma is two-lobed.

No properties of any importance have been attributed by medical men to any plant of the order. Aloÿsia citriodòra (commonly called the Lemon-scented Verbena) is esteemed for the fragrance of its leaves. The other genera best known are, Clerodéndron, Volkamèria, Vìtex (the Chaste Tree), Lantàna, and Téctona (the Indian Teak), the timber of which is so much used for ship-building.

Order 144. MYOPÓRINÆ.

South Sea and New Holland shrubs with scarcely any downy hairs. The leaves are simple, alternate, or opposite, and without stipules. The flowers, which are scarlet, white, or blue, are axillary and without bracts. The principal genera are, Myóporum, Stenochìlus, Bóntia, and Avicénnia (the White Mangrove of Brazil).

Order 145. ACANTHÀCEÆ.—THE ACANTHUS FAMILY.

Herbaceous plants or shrubs, which are almost entirely tropical, and in such regions extremely common, constituting, in fact, a large portion of the weedy herbage. It is only in some rare instances that they advance far to the north, as in the genus Acánthus, found in Greece, and in a few species inhabiting the United States.

The species are known by the elastic opening of their capsules (which are two-celled), and the hooked points of the seeds, by which they are attached to the placenta. The calyx remains on the ripe fruit, but in most of the plants it is so extremely small as to be inconspicuous, and its place is supplied by three large leafy bracts. The corolla varies considerably, being sometimes two-lipped, as in Justícia, sometimes funnel-shaped, as in Ruéllia, and sometimes campanulate, with a spreading five-cleft limb, as in Thunbérgia. There are only two stamens in Justícia and some of the other genera, but in Thunbérgia, Acánthus, and Ruéllia, there are four of unequal length, enclosed within the throat of the corolla. The ovary is imbedded in a disk, and it is two or many-seeded: the style is simple, and the stigma one or two-lobed.

Some of the species are very showy: their leaves are opposite, occasionally arranged in fours, simple and undivided, or very seldom lobed: their flowers are either in imbricated heads or open racemes, always enclosed in their bracts, and they are white, blue, yellow, scarlet, or purple. The Thunbérgias are fine climbers; and the *Acánthus móllis* (the sinuated leaves of which gave rise to the classical acanthus of architecture) is, perhaps, one of the most interesting of hardy herbaceous plants. It is also one of the few species of the order to which any medicinal properties are ascribed, being used sometimes as an emollient, on account of its mucilage. Some of the species of Justícia, Aphelándra, Eránthemum, and Ruéllia are also beautiful plants.

Order 146. OROBANCHÈÆ.—THE BROOM-RAPE FAMILY.

These are leafless parasites, growing on the roots of other plants, with brown or colourless scaly stems and flowers. The best known genera are Lathræ̀a (the Toothwort), and Orobánche (the Broom-rape), both British plants.

Order 147. LENTIBULÀRIÆ.

These are very pretty interesting marsh or aquatic plants, which are scarcely susceptible of cultivation, except in a few cases. The Pinguículas (the flowers of which resemble a violet) are either European or North American, inhabiting elevated patches in bogs: the Utriculàrias are floating plants, found in most countries in marshes and little rills: their flowers are white, yellow, or blue.

Order 148. PRIMULÀCEÆ.—THE PRIMROSE FAMILY.

Beautiful dwarf annual or perennial herbaceous plants, inhabiting the mountains and meadows, hedges and groves, of all parts of the world, but especially in the northern hemisphere.

Many of the plants of the order are well known; and they may all be easily recognised by the stamens, or rather anthers (for they have scarcely any filaments), being inserted upon the corolla in the centre of the lobes, instead of alternating with them, and by the capsule, though five or ten-ribbed, being only one-celled, with a central placenta, to which the seeds are attached. The calyx remains on the ripe fruit. In the genus Prímula (the Primrose), the calyx is tubular, and strongly marked with five distinct angles, which end in as many teeth; and the corolla is salver-shaped, with a contraction in the tube, at the insertion of the stamens, the five segments of the limb being wedge-shaped and notched. The style is slender, and the stigma capitate. The capsule opens naturally by ten teeth, which curl back. The Cýclamen (or Sow-bread), another genus belonging to the order, has the lobes of the corolla bent back; and when the flower falls, the peduncle coils up in a most curious manner, so as to bury the seed-vessel in the earth. The seed-vessel of the Pimpernel (Anagállis) resembles a round case with a lid, which may be taken off, displaying a great number of seeds, so closely packed that no room is lost.

The properties of the plants of the order are of little importance: they appear to be slightly astringent and bitter. The tuberous roots of the Cýclamen, though very acrid, are eaten by the wild boars of Sicily, and hence the plant is called Sowbread. The flowers of the Primrose and Cowslip are fragrant, and from those of the latter a pleasant soporific wine is made.

The principal other genera are, Dodecàtheon (the American Cowslip), Soldanélla, Cortùsa (the Bear's-ear Sanicle), Andrósace, Arètia, Trientàlis (the Winter Green—one species of which, *T. europæa*, is a rare and very beautiful little British plant), Hottònia (the Water Violet), Lysimàchia (the Loose strife), and Sámolus (the Brookweed).

Order 149. GLOBULÀRIÆ.

Pretty alpine plants, most of which have blue flowers. The leaves of *Globulària Alÿpum* are very bitter.

Order 150. PLUMBAGÍNEÆ.—THE LEADWORT FAMILY.

Low shrubs or herbaceous plants, mostly with showy red or blue flowers, inhabiting salt marshes and subalpine tracts in the temperate latitudes of both the northern and southern hemispheres.

The principal genera are Státice (the Sea Lavender), Armèria (the Thrift), and Plumbàgo (the Leadwort). The corolla in these plants is either monopetalous, with the stamens free from the corolla and growing from beneath the pistil, or with five petals, to which the stamens are attached. There are five styles and five stigmas, but the ovary is only one-celled and one-seeded. The fruit is thin and dry.

All the species of the order are fine plants. The pedicels of all the kinds of Sea Lavender, especially of *Státice arbòrea,* are coloured, and are often mistaken for the flowers. The root of *S. Limònium* is astringent and tonic; and the root and whole plant of all the species of Plumbàgo are acrid and caustic.

Subdivision II. MONOCHLAMÝDEÆ. *Perianth simple.*

The absence of a corolla characterises this subdivision of the dicotyledonous plants; but, as the term corolla is subject to frequent misunderstanding, it should be borne in mind, that whenever there is only one floral envelope, that envelope is to be considered a calyx, whether green, as in most cases, or coloured, as in the Marvel of Peru.

Order 151. PLANTAGÍNEÆ.

These are little inconspicuous herbaceous plants, found in waste places in nearly every part of the world. As an example, the weed called Plantain or Rib Grass (Plantàgo) may be instanced. This is a well-known plant, remarkable for its strongly-ribbed leaves, which form a flat tuft on the ground, and for the large arrow-shaped anthers of its four stamens, which hang on very slender filaments. The flowers, which are green and inconspicuous, are arranged in dense spikes, and of these, when ripe, quantities are gathered as food for birds. The seeds of one species (*Plantàgo arenària*) are imported in large quantities from the south of France for the purpose of forming an infusion in which muslins are washed. Littorélla (the Shore-weed) is another plant of this order.

Order 152. NYCTAGÍNEÆ.

With the exception of two or three genera, most of these are weeds, growing often among the loose sand on the sea-coast of the tropics and the western hemisphere. The most striking and interesting genera are Mirábilis, Abrònia, and Bougainvillæa.

In the Marvel of Peru (*Mirábilis Jalàpa*) the flowers consist of a coloured calyx, surrounded by a five-toothed involucre, which greatly resembles a calyx. The true calyx is funnel-shaped, with a spreading limb, the lobes of which are plaited and notched at the margin, and which, with the tubular part, form at the base a globular swelling, enclosing the ovary. The stamens grow from beneath the pistil, adhering together at the base, so as to form a kind of cup. The ovary contains only one seed; and the style is long and slender, terminating in a capitate stigma, divided into a number of tubercles or warts. The lower part of the calyx remains on the ripe fruit, hardening into a kind of shell. The root of this plant was formerly supposed to be the true Jalap, but that is now known to be an error.

In Bougainvillæa, the beautiful mauve bracts are the chief feature of the plant.

Order 153. AMARANTHÀCEÆ.—THE AMARANTH FAMILY.

Herbaceous plants or shrubs, growing in crowds or singly, either in dry, stony, barren places, or among thickets upon the borders of woods, or a few even in salt marshes. They are much more frequent within the tropics than beyond them, and are unknown in the coldest regions of the world. Many are weeds, but some are very ornamental, as the Iresìne, the Alternanthèra, a few species of Amaránthus, the Cock's-combs, and the Globe Amaranth.

The flowers of the plants of this order are either in spikes, like Love-lies-bleeding (*Amaránthus caudàtus*), in heads, like the Globe Amaranth (*Gomphrèna globòsa*), or of a singular crest-like shape, like the Cock's-comb (*Celòsia cristàta*). In all, the flowers have no corolla, and only a very thin dry calyx, which is surrounded by hard, thin, dry bracts, of the same colour, each ending in a long point. There are generally five anthers, and two or three styles, with pointed stigmas; but the capsule contains only one cell and one seed, and, when ripe, it divides horizontally in the middle, like the capsule of the Pimpernel.

Order 154. PHYTOLÀCEÆ.—THE POKE-WEED FAMILY.

Herbaceous plants or shrubs, with racemes of red, white, or greenish flowers. Many of them are natives of America, within or without the tropics; others of Africa and India. One species, the Virginian Poke (*Phytolácca decándra*), is remarkable for being found wild in climates so different as Spain and Portugal, the north of Africa, Jamaica, and North America. The very dark purple berries of this plant were formerly used for colouring port wine.

Order 155. CHENOPÒDEÆ.—THE GOOSEFOOT FAMILY.

The plants belonging to this order, which are herbaceous or shrubby, bear considerable resemblance to those of the order Amaranthàceæ, but their flowers are disposed in loose clusters without bracts, and all their parts are fleshy; while the flowers of the Amaranthàceæ are in dense spikes with bracts, which, as well as the divisions of the flowers, are quite hard and dry. The stamens are five in number, and they are spread out like those of the Nettle family. There are two styles with hairy stigmas; and the capsule resembles the Echìnus, or Sea Urchin. The leaves of all the species are somewhat succulent, and they are frequently stained with brilliant colours.

The principal genera of the order are, Spinàcia (the Spinach), Bèta, containing the red and white Beet (*B. vulgàris*), the Mangold Wurtzel (*B. v. macrorhìza*), and the Chard Beet (*B. Cìcla*), Blìtum (the Strawberry Blite), Chenopòdium (Goosefoot), Salicórnia (the Glasswort, the ashes of which are used in making glass), Salsòla (the Saltwort, from the ashes of which soda is prepared), and Átriplex (the Garden Orache). Very good sugar is obtained from Beet-root.

Order 156. BEGONIÀCEÆ.

Herbaceous plants or succulent undershrubs with an acid juice, common in the West Indies, South America, and the East Indies. The roots are astringent and slightly bitter. The principal genus is Begònia, most of the species of which are pretty; some very handsome. The leaves are strongly-veined, have large stipules, and are generally of a beautiful crimson on the under side. The flowers are male and female, the first consisting of four sepals, two of which are much longer than the others, and a beard of anthers, with the filaments united into one common stalk, and each anther containing two cells for pollen; while the female flowers have five sepals, beneath which there is a thick and fleshy part, having three unequal wings. This part becomes the capsule, and it is furnished with three stigmas, each of which has two curiously twisted lobes. The capsule, when ripe, has three wings, one much longer than the others, and it is three-celled, each cell containing a central placenta with a double row of seeds, which are covered with a beautifully reticulated skin.

Order 157. POLYGÒNEÆ.—THE BUCKWHEAT FAMILY.

Herbaceous plants or undershrubs with fleshy leaves, growing in ditches, hedges, waste grounds, and in other situations in most parts of the world. Many of the plants are weeds, as the Docks; but some are handsome, as some of the species of Polýgonum and the species of Eriógonum.

The order contains several well-known plants, as the Rhubarb (Rhèum), Sorrel (*Rùmex Acetòsa*), and the Buckwheat (*Polýgonum Fagopỳrum*).

Order 158. LAURÍNEÆ.—THE SWEET BAY FAMILY.

These are noble trees or shrubs, with handsome leaves and inconspicuous flowers, chiefly natives of hot countries, where they constitute some of the most valuable productions known under the name of spice. They are recognised by the singular circumstance of their anthers having each four cells, the valves of which are hinged as it were to the upper edge of each cell, and do not open longitudinally like those of most other plants.

Some of the most interesting plants of the order are, the Sweet Bay (*Laúrus nóbilis*), the Sassafras-tree (*L. Sássafras*, or *Sássafras officinàle*), which yields the

Sassafras chips of the shops; the Cinnamon-tree (*L. Cinnamòmum* or *Cinnamòmum vèrum* or *zeylánicum*); the Camphor-tree (*L. Cámphora* or *Cámphora officinàrum*); and the Alligator Pear (*L. Pérsea* or *Pérsea gratíssima*), an agreeable West Indian fruit.

Order 159. MYRISTÍCEÆ.—THE NUTMEG FAMILY.

These are tropical trees, closely allied to the last order, often yielding a red, viscid, acrid juice. The most interesting plant is the Nutmeg (*Myrística moschàta*), the aril of which is known under the name of Mace, and envelopes the Nutmeg. This tree is a native of the East Indies.

Order 160. PROTEÀCEÆ.—THE PROTEA FAMILY.

These are handsome shrubs or small trees with evergreen, simple, narrow, entire or serrated leaves, which have a hard, dry appearance: mostly natives of the Cape of Good Hope and New Holland. The flowers generally grow in clusters, and are green, yellow, or red, sometimes surrounded by coloured bracts with dark hairy margins. There are four stamens, with distinct anthers, which rarely adhere together. The fruit is of various kinds, either a solitary nut, or a sort of cone consisting of many nuts immersed among the indurated remains of abortive flowers. The Proteas of the Cape and the Banksias and Dryandras of New Holland are the finest plants of the order. Of the other genera the best known are Leucadéndron, Isopògon, Grevíllea, and Rhopàla.

Order 161. THYMELǢÆ.—THE SPURGE-LAUREL FAMILY.

Most of these are shrubby plants, found in India and South America and various other parts of the world, but most abundantly at the Cape of Good Hope and in New Holland. The leaves are without stipules, alternate or opposite, entire, either smooth or silvery, and very neat. The flowers are white, yellow, or red, most commonly in clusters, and often fragrant. The wood is particularly soft; and the inner bark is easily separable, and, in one species, capable of being pulled out into a sort of network resembling lace, as in the Lace-bark Tree of Jamaica (*Dáphne Lagétta* or *Lagétta linteària*). The Mezereon (*D. Mezèreum*) and the Spurge-Laurel (*D. Laurèola*) are two well-known garden shrubs.

Though the seeds of the plants of this order are poisonous to man, birds eat them with impunity.

Of the other genera the best known are, Dírca (the Leatherwood), Gnídia, Lachnæ̀a, Passerìna (the Sparrow-wort), Struthìola, and Pimelèa.

Order 162. OSYRÍDEÆ.

Exotic trees with flexible twiggy branches, and white or greenish flowers. The only genera are Osȳris (the Poet's Cassia, a native of the South of Europe), and Exocárpos (the species of which are found in Australia).

Order 163. SANTALÀCEÆ.—THE SANDAL-WOOD FAMILY.

These are trees or shrubs or dwarf herbaceous plants, with inconspicuous or unattractive flowers. They are chiefly natives of the Cape of Good Hope, New Holland, and India, a few only being found in Europe and North America. The most interesting plant is the Sandal-wood of the East Indies (*Sántalum álbum*), which is chiefly known as a perfume, though it is said to possess sedative and cooling qualities. The genus Nýssa contains hardy North American trees, one of which is the Tupelo tree, and another is the Ogechee Lime.

Order 164. ELÆÁGNEÆ.—THE OLEASTER FAMILY.

Hardy trees or shrubs, with deciduous leaves, which, as well as the bark, are covered with minute silvery scales. A few inhabit China and Japan, and the remainder are found in Europe, North America, Guiana, and the East Indies. The flowers, though small and inconspicuous, are sometimes agreeably fragrant. The three principal genera are Hippóphaë (the Sea Buckthorn) Elæágnus (the Oleaster), and Shephérdia. The berries of *Hippóphaë rhamnöìdes*, which are slightly acid, are used as a sauce with fish by the Swedes.

Order 165. ASÁRINÆ.—THE BIRTHWORT FAMILY.

The species are herbaceous or half-shrubby plants (some climbing), with simple, often reniform, leaves, and grotesque flowers, which are usually of a brownish purple. Very common in the equinoctial parts of South America, and rare in other countries; found sparingly in North America, Europe, and Siberia; and in small numbers in India. The roots of all are bitter, and possessed of tonic and stimulating properties.

The two principal genera are Ásarum and Aristolòchia. One species of Ásarum, or Asarabacca, is a British plant (*A. europǽum*), having purplish flowers and kidney-shaped leaves, and is used medicinally; while another species (*A. canadénse*), called the Wild Ginger of North America, has purplish-brown flowers on very short footstalks, which resemble the flowers of the genus Stapèlia both in appearance and smell. The flowers of Aristolòchia are remarkable for their very singular shape: they are tubular with one lip much longer than the other; and the tube takes an abrupt bend near the middle. There are six anthers, fixed very curiously on the outside of a club-shaped column, split into six lobes at the point. In the centre of this column is a style with a six-rayed stigma; and the fruit is a large capsule with six cells, which opens by as many slits, and discharges the numerous thin, flat, dark brown seeds.

Order 166. CYTÍNEÆ.—THE PITCHER-PLANT FAMILY.

The genus Nepénthes (the Chinese Pitcher Plant) is the only one in this order. This curious plant has leaves with tendrils, the extremities of which are

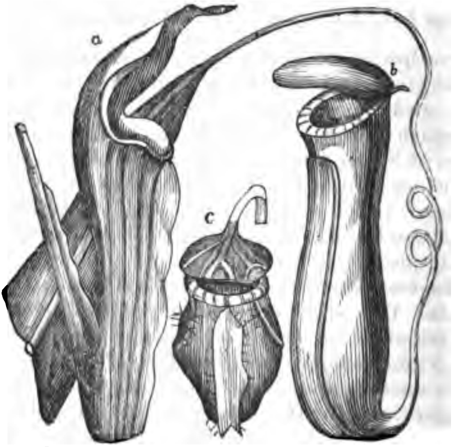


Fig. 126—Different kinds of Pitchers: *a*, pitcher of Sarracènia; *b*, pitcher of Nepénthes; *c*, pitcher of Cephalòtus.

hollowed out into cup-like appendages that are generally filled with water, which seems as if confined within them by the little lid with which the pitchers are surmounted. The male and female flowers, which do not possess much beauty, are on different plants.

The new Holland Pitcher Plant (*Cephalòtus folliculàris*), which was formerly placed in the order *Rosàceæ*, is now considered to belong to the Crowfoot Family (*Ranunculàceæ*). (Sarracènia is described in p. 73.)

Order 167. EUPHORBIÀCEÆ.—THE SPURGE FAMILY.

Trees, shrubs, or herbaceous plants, often abounding in acrid milk: in cold countries they are mostly herbaceous; in hot countries shrubby or tree-like. They are found in the greatest abundance in equinoctial America. The species are chiefly known for their various medicinal properties. The genus Euphórbia contains more than a dozen British species, one of which is the well-known weed called the Caper Spurge (*E. Láthyris*); and a great many showy exotic species, some of which are frequently seen in our collections of stove-plants. In this genus the male and female flowers are distinct; but both are enclosed in one cup-like involucre. The fruit consists of three carpels (each containing a single seed), which divide with elasticity when the seeds are ripe.

Other interesting genera are, Mercuriàlis (the Mercury) ; Siphònia, the sap of which yields the indian-rubber used for the macintosh cloaks, &c., it being more suitable for that purpose than the caoutchouc yielded by the *Ficus elástica*, which is the true Indian Rubber Tree; Búxus (the Box), the tree kind of which furnishes the wood used for wood engraving; Cròton, of which there are many species with beautiful leaves, and one species (*C. Tíglium*) yields the celebrated Croton oil; Játropha, one species of which (*J. Múnihot*) yields the Cassava, which, though poisonous in a raw state, becomes the wholesome food called Tapioca when properly prepared; Rícinus, the Palma Christi, the seeds of one species of which (*R. commùnis*) yield the well-known castor oil; and Hippómane (the Manchineel tree), which is said to be so poisonous that persons have died from merely sleeping beneath its shade.

Order 168. STACKHOÚSEÆ.

Small New Holland shrubs with insignificant flowers.

Order 169. ANTIDÉSMEÆ.

East Indian trees or shrubs with simple leaves and inconspicuous diœcious flowers. *Stilàgo diándra* bears an acid eatable fruit (hanging in clusters like currants), as well as the species of Antidésma. A decoction of the leaves of one species of Antidésma is reputed to be an antidote against the bites of serpents.

Order 170. URTÍCEÆ.—THE NETTLE FAMILY.

Trees, shrubs, or herbaceous plants. Widely dispersed over every part of the world, some being found in the most northern regions, and some in the hottest climates of the tropics. Many are weeds; some are covered with rough points; and others defended by stinging hairs. Some have very tough fibre, as the Hemp and the Nettle; and some have a milky sap, as the Fig, the Mulberry, and the Bread Fruit. In all the genera the male and female flowers are distinct, that is to say, some of the flowers have only stamens, and the others only a pistil; the latter, of course, being the only ones that produce seed. None of the flowers have any corolla; and in all the male flowers, the stamens, which are erect at first, spring back with elasticity to discharge their

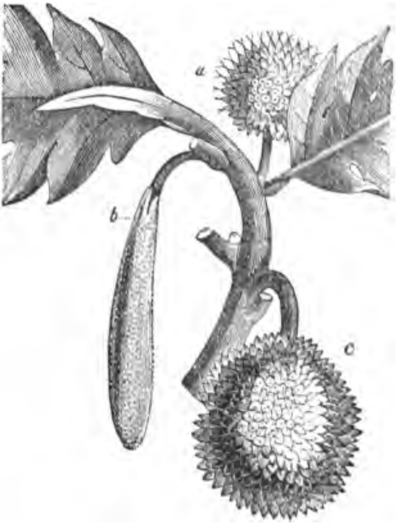


Fig. 127.—Branch of Bread-fruit tree, bearing *a*, *c*, clusters of pistilline flowers; *b*, clusters of stamineous flowers.

pollen, and afterwards remain extended; while the female flowers have a one-celled ovary with a simple fringed stigma. The seeds of all are enclosed in nuts; though the eatable part varies, being in some the dilated receptacle, as in the Bread-fruit and the Fig, and in others the metamorphosed calyx, as in the Mulberry.

Many of the plants of the order are of great use to man, as the Fig, the Mulberry, the Hop, the Hemp, and the Bread Fruit. Even the Common Nettle (*Urtîca diöíca*), so commonly regarded as a noxious weed, might doubtless be usefully employed in the manufacture of paper. Other plants of interest are: the Jack tree (*Artocárpus integrifòlia*), which bears fruit of an oblong form, often seventy or eighty pounds in weight, the pulp of which, however, is inferior to the Bread-fruit and is seldom eaten, but the seeds are considered very good, and when roasted are said to have the flavour of sweet chestnuts; the Cow-tree, or Palo de Vaca, of South America (*Galactodéndron ùtile*), which yields a copious supply of a rich and wholesome milk, as good as that of the cow; the Upas, or Poison-tree of Java (*Antiàris toxicària*), about which so many fabulous stories have been told,

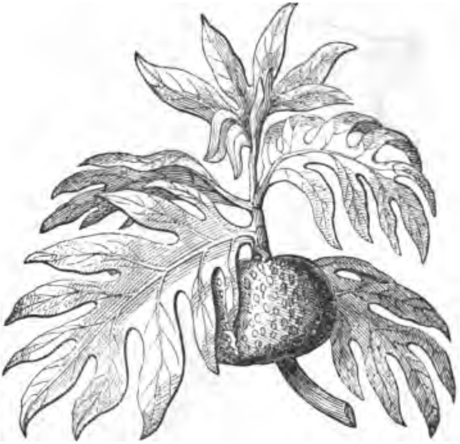


Fig. 128.—Artocárpus incisa, or Bread-fruit.

the juice of which is, indeed, a frightful poison, but the baneful effects of whose branches are purely imaginary; the Paper Mulberry (*Broussonètia papyrífera*), the liber or inner bark of which is used for making what is called Indian paper; the Osage Orange (*Maclùra aurantìaca*); the Banyan tree (*Fìcus índica*), so remarkable for its vast rooting branches; the Indian rubber tree (*F. elástica*); and the Pippul tree, or Sacred Fig (*F. religiòsa*), which takes its specific name of *religiòsa* from the legend that the Hindoo god Vishnoo was born under its branches.

Order 171. ULMÀCEÆ.—THE ELM FAMILY.

Trees or shrubs, natives of the north of Asia, the mountains of India, China, North America, and Europe; in the latter of which countries they form valuable timber trees. The Elm (*Ŭlmus*) is the representative of the order; and other genera are Céltis (the Nettle tree), and Plánera (the Zelkoua tree).

Order 172. PIPERÀCEÆ.—THE PEPPER FAMILY.

Shrubs or herbaceous plants, generally climbing, more valuable in commerce than interesting in cultivation, their flowers being in all cases insignificant, and their leaves so uniform in appearance as to produce little variety. They are principally found in the hottest parts of the world. The best known genera are Pìper, which contains the common Pepper (*P. nìgrum*), the Betle (*P. Bètle*), and several other species; and Peperòmia.

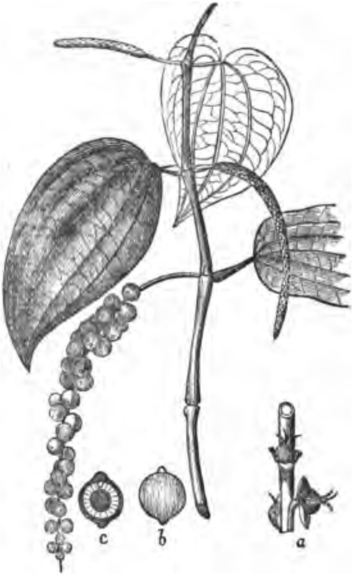


Fig. 129.—Branch of Black Pepper, with spikes of unopened flowers above, and of fruit below; *a*, portion of flower-stem, with three flowers; *b*, single fruit; *c*, the same cut open.

Order 173. Juglándeæ.—The Walnut Family.

Large trees, chiefly found in North America, with pinnate leaves, and insignificant flowers. The kernels of the nuts are eatable.

Jùglans contains the common Walnut (*J. règia*), and other species. Other genera are Càrya (the Hickory), and Fortunæa.

Order 174. AMENTÀCEÆ.—THE CATKIN-BEARING FAMILY.

In this order are included most of the timber trees of Europe, and also most of those of all cold countries; and every genus contains plants of importance to man. Collected in it are the Alder (Álnus), the Birch (Bétula), the Willow (Sàlix), the Poplar (Pópulus), the Oak (Quércus), the Nut tree (Córylus), the Sweet or Spanish Chestnut (Castànea), the Beech (Fàgus), the Hornbean (Cárpinus), the Plane (Plátanus), and others. The male flowers are in catkins, and the fruit of most of the genera is, when ripe, partially or wholly enclosed in a cup-like involucre. The bark of some of the trees is useful, either for tanning or for staining black. Cork is the bark of a

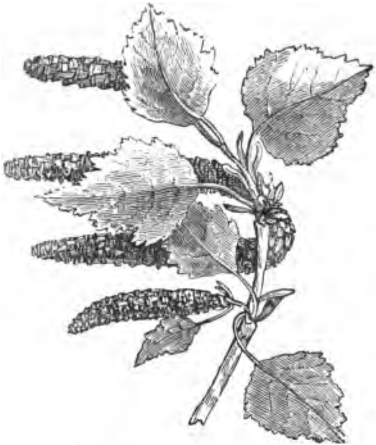


Fig. 130.—Catkins of the Birch.

species of Oak (*Quércus Sùber*). The Nut-galls that writing-ink is prepared from are the produce of *Quércus infectòria*, through the agency of an insect.

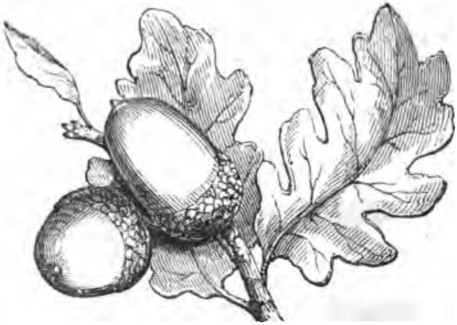


Fig. 131.—Acorns (the fruit of the Oak).

Order 175. HAMAMELÍDEÆ.—THE WITCH-HAZEL FAMILY.

Hardy trees or shrubs, natives chiefly of North America, Japan, and China. The best known genera are Hamamèlis (the Witch Hazel), and Fothergílla. The Witch Hazel has the peculiarity of flowering in October or November, the flowers, which are yellow, and produced in great abundance, sometimes lasting till spring.

Order 176. CONÍFERÆ.—CONIFEROUS PLANTS, OR THE PINE FAMILY.

Many of these are noble trees, or evergreen shrubs, yielding valuable timber, abounding in resin. Among them are some of the loftiest trees in the world. They are found in various parts of the world, but principally in temperate regions. Most of the genera have what are called needle-shaped leaves, that is, their leaves are long and narrow, and terminate in a sharp point. The male and female flowers are both produced in catkins, and both consist only of scales. The pollen of the male flowers is very abundant, and is discharged freely in fine weather. The female flowers form cones, consisting of numerous scales, at the base of each of which are two winged seeds. The seeds are oily, and those of some of the pines are eatable as nuts. The leaves of the Yew are poisonous,

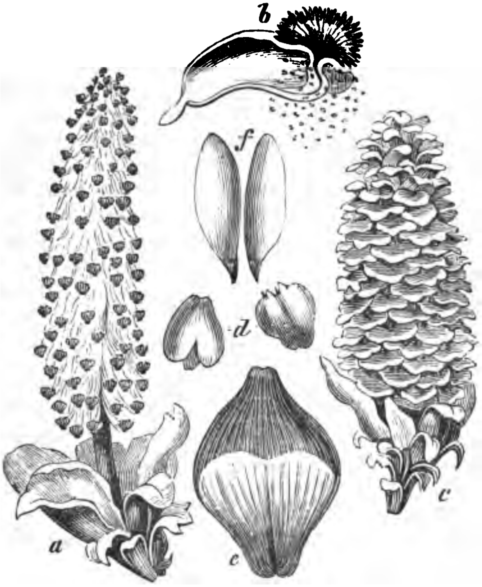


Fig. 132—Inflorescence of Àbies excélsa; *a*, Male catkin; *b*, Anther, shedding its pollen; *c*, Female catkin; *d*, Scales of female catkin; *e*, Scale of ripe cone; *f*, Seeds.

and this is an exception to the general innoxious character of the order. Pitch, turpentine, and Venice turpentine are produced by various species. Their timber, in commerce, is known under the names of Deal, Fir, Pine, and Cedar; and is principally the wood of the Spruce, the Larch, the Scotch Fir, the Weymouth Pine, and the Virginian Cedar; but other kinds are of at least equal, if not greater value.

The principal genera are: Pìnus (the Pine), Àbies (the Spruce Fir), Pícea (the Silver Fir), Làrix (the Larch); Cèdrus (the Cedar), Sciadópitys, Araucària (containing the Chili Pine and the Norfolk Island Pine), Juníperus (the Juniper), Saxe-Gothæ̀a, Thùja (the Arbor Vitæ), Fitzroýa, Cryptomèria, Cupréssus (the Cypress), Retiníspora, Cállitris, Taxòdium, Sequoía, Wellingtònia, Glyptostròbus, Táxus (the Yew), Cephalotáxus, and Salisbùria (the Ginkgo tree).

Order 177. EMPÉTREÆ.

Dwarf heath-like shrubs, with inconspicuous flowers and dark berries, natives of Europe and North America. The Crowberry (*Émpetrum nìgrum*) is common in Scotland on heaths. The black berries are sub-acid and unpleasant to the taste.

Class II.—MONOCOTYLEDÒNEÆ, or Endógenæ (*endon*, inside, *geinomai*, to grow).

Order 178. CYCÀDEÆ.—THE CYCAS FAMILY.

Small trees or shrubs, sometimes resembling Palm trees in their appearance. The leaves are pinnate, and when they expand, they unroll like the fronds of ferns. The male flowers are in cones, and the female flowers are either in cones, or produced on the margins of contracted leaves. The species are chiefly natives of the Cape of Good Hope and equinoctial America. The principal genera are Cy̆cas (one species of which yields a kind of sago, but not the true kind, as that is the product of a species of Palm), Zàmia, and Encephalártos.

Order 179. HYDROCHARÍDEÆ.—THE FROG-BIT FAMILY.

Floating or water plants, with white flowers, chiefly natives of fresh water in Europe, North America, and the East Indies. The principal genera are, Anácharis, Vallisnèria, Hydrócharis, Damasònium, and Stratiòtes.

Order 180. ALISMÀCEÆ.—THE WATER PLANTAIN FAMILY.

These are handsome water plants with white or pink flowers. Some are common in our English ditches (as Alísma, Sagittària, and Actinocárpus), and others are found in similar situations in the tropics. The Water Plantain (*Alísma Plantàgo*) has ribbed leaves, and a loose panicle of small pinkish flowers, which have a permanent calyx of three sepals, a corolla of three petals, six stamens, and numerous carpels, which grow close together so as to form a head, as in the Ranúnculus Family. The common Arrow-head (*Sagittària sagittifòlia*) has curiously shaped leaves, resembling the head of an arrow. The flowers (which are in whorls) are white with a pink spot at the base of each petal. The Common Star-

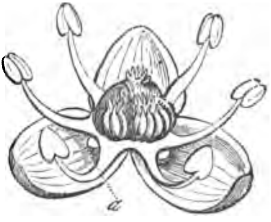


Fig. 133.—Flower of Alísma Plantàgo, with the corolla removed, showing the three sepals of the calyx, and six stamens; *a*, undeveloped stamen.

fruit (*Actinocárpus Damasònium*) has only six carpels, which are so arranged as to form a star-like fruit when ripe.

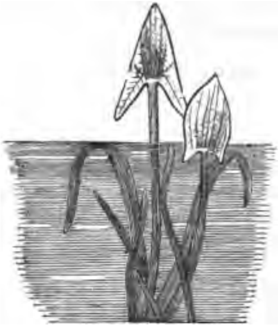


Fig. 134.—Sagittària sagittifòlia, or Arrow-head; showing expanded petioles beneath the water, and true leaves above.

Order 181. BUTÒMEÆ.—THE FLOWERING RUSH FAMILY.

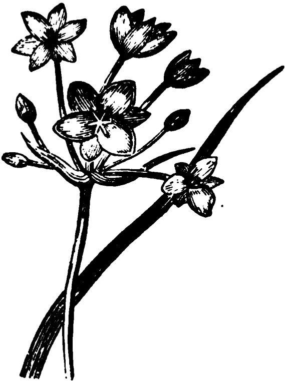


Fig. 135.—Bùtomus umbellàtus.

Fine water plants, of which *Bùtomus umbellàtus* is one of the most beautiful of British aquatic plants. The flowers are rose-coloured, crimson, or white; and they are produced in large erect umbels. The calyx and corolla (each in three divisions) are generally of the same colour; there are nine stamens; and six capsules, which are many-seeded. The leaves are triangular or flat. Another plant belonging to this order is *Limnócharis Plumièri,* a very handsome Brazilian aquatic with yellow flowers.

Order 182. JUNCAGÍNEÆ.—THE ARROW-GRASS FAMILY.

These are herbaceous aquatic or marsh plants, the leaves of which have in all cases parallel veins, whether they are narrow and grassy, or broad and quite different from the leaf-stalk. The flowers are white or green, and are produced in spikes or racemes. The species are found in marshy places in most parts of the world. The principal genera are, Triglòchin, Scheuchzèria, and Ouvirándra.

Order 183. ORCHÍDEÆ.—THE ORCHIS FAMILY.

This is the most singular of all the families of plants and the most fragrant, occurring all over the world, except in the coldest regions, and those where everlasting dryness reigns. In temperate countries the species are terrestrial, and in warmer climates they are epiphytes (that is, growing on trees), or they fix themselves to stones. Their flowers are often remarkable for their grotesque forms, some resembling the heads and bodies of animals, as the Bee Orchis, the Fly Orchis, the Spider Orchis, the Lizard Orchis, the Man Orchis. The British Orchids are all terrestrial. In these the leaves are alternate, with an entire margin, without any footstalk, and sheathing the stem at the base. The flowers are produced in a spike, furnished with bracts; and though they are very irregular in their forms, there are certain particulars in which they all agree. Though they are in reality sessile, they appear to have each a footstalk, but this footstalk is only the long twisted ovary, which is one-celled and many-seeded, and which serves to support the calyx and corolla of the flower, which are both above it. The calyx consists of three sepals, one of which has the appearance of a hood, and the others look like wings. The petals are very disproportionate in their size: two are generally very small, and are only seen peeping beneath the hood of the calyx; while the third, which is called the labellum or lip, is very large, and hangs down. In the centre of the flower is a singular mass, called the column, composed of the stamens and pistil, grown together. There are three anthers, one perfect, and two imperfect: the perfect anther consists of a bag, which, when opened, displays two stalked masses of globular pollen. The stigma is a kind of cup half full of a glutinous fluid, but it appears entirely shut out from the pollen, which is not only enclosed in its pouch or bag, but is so solid and waxy as to prevent the possibility of its being carried by wind or insects to the stigma. Nature, however, has contrived a means of overcoming the difficulty. At the foot of each stalk of the pollen masses there is a little protuberance, covering a gland, through which the pollen descends to the stigma, and thence to the ovary. The different genera are distinguished partly by the manner in which the granules of the pollen adhere together, and partly by the shape of the flowers; and their different species vary principally in the form of the labellum. In the genera Órchis and Habenària, the labellum is drawn out behind into a kind of spur; and in others it assumes strange shapes, as in the Man Orchis (*Áceras anthropóphora*), in which the labellum looks like a little man; and in the Lizard Orchis (*Órchis hircìna*), in which the labellum is drawn out into a long tail, looking like the tail and long body of the lizard, while the petals, which are long and narrow and bent back, look like the hind legs. In the genus Òphrys the labellum also takes strange shapes, in one species resembling a bee, in another a fly, and in others a spider. In the Lady's Slipper (*Cypripèdium Calcèolus*), a very rare British orchid, the two side stamens have perfect pollen-bearing anthers, & only the central one is imperfect. There are only about fourteen genera of British orchids (containing about forty species); but of exotic orchids there are three or four hundred genera and several thousand species, the flowers of many of which are most lovely, and most delightfully fragrant, while in many the forms are most singular and fantastic. Very few species indeed can be said to be in any way useful to man, except affording him pleasure by their beauty and fragrance. From the roots of some of the Orchises the nutritious substance called Salep is prepared; and the Vanilla of the shops is the dried pod of a species of the genus called Vaníllа.

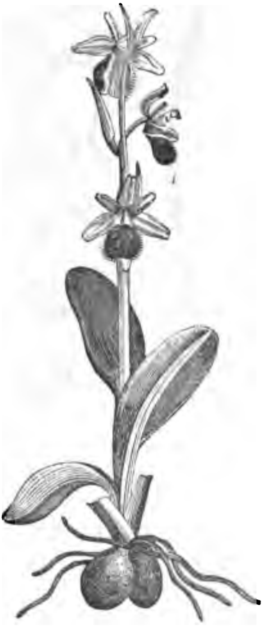


Fig. 136.—Spider Orchis.

As examples of exotic Orchids, two are given in fig. 137 on page 226 (both epiphytes).

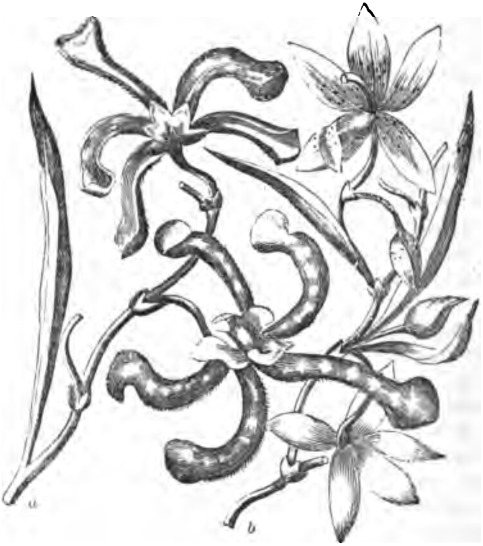


Fig. 137.—(*a*) Renanthèra arachnites. (*b*) A Javanese Orchideous epiphyte.

Order 184. SCITAMÍNEÆ.

These are aromatic herbaceous plants, nearly all of which are tropical. They have long broad leaves, and the flowers are white, yellow, or red, often very fragrant, and generally possessing much beauty, as, for example, the species of Hedýchium, Alpínia, and Curcùma. Most of the genera have a creeping underground stem, called a rhizoma, for the aromatic stimulating properties of which they are chiefly valued, such as are found in the Ginger (*Zíngiber officinàle*), the Galangale (*Alpínia racemòsa* and *A. Galánga*), the Zedoary (*Curcùma Zedoària* and *C. Zerúmbet*), and other species of Curcùma. Others are known for their dyeing properties, as Turmeric, which is obtained from *Curcùma lónga.*

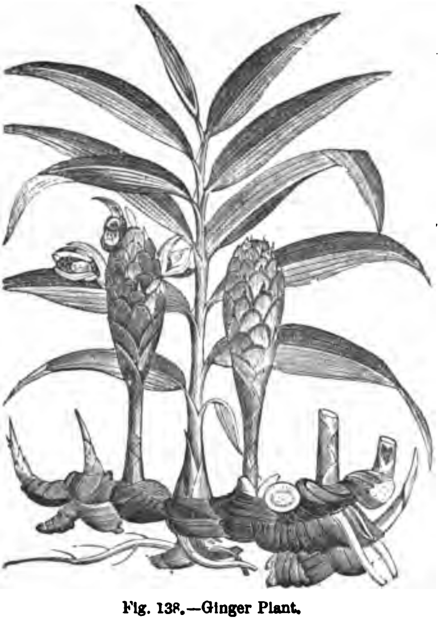


Fig. 138.—Ginger Plant.

Order 185. CÁNNEÆ.—THE INDIAN-SHOT FAMILY.

Herbaceous plants, the greater part of which are found in tropical America and Africa. The most interesting genera are Cánna (the Indian Shot), the species of which are large-leaved reed-like plants with brilliant flowers, as, for example, *C. índica;* and Maránta, the roots of which furnish Arrow-root.

Order 186. MUSÀCEÆ.—THE PLANTAIN FAMILY.

These are noble plants, all remarkable for the beauty of their foliage, and many for their striking brilliant flowers. The genus Mùsa is prized for its pleasant wholesome fruit, which is known under the names of Plantain and Banana. The flowers are produced in spikes enclosed in spathe-like bracts, which are often richly coloured. The massive clusters of fruit are often of enormous weight. The leaves are very large and strong; and the most delicate Indian muslins are manufactured from the fibres of one of the species (*M. téxtilis*).

The principal other genera are Strelítzia and Helicònia, both remarkable for the brilliant colours of their flowers.

Order 187. IRÍDEÆ.—THE IRIS FAMILY.

These are fibrous or tuberous-rooted plants, with very beautiful fugitive flowers, principally natives of the Cape of Good Hope, or of the middle parts of North America and Europe, and more remarkable for their beauty than for their utility. The leaves are generally long and flat, with the edge towards the stem, and the flowers are produced from spathes: the perianth is in six segments coloured alike, the calyx and corolla being in most cases confounded together. The principal genera are Ìris, Moræ̀a, Márica, Homèria, Sisyrínchium, Reneálmia, Patersònia, Witsènia, Ferrària, Tigrídia, Herbértia, Babiàna, Watsònia, Antholỳza, Gladìolus, Sparáxis, Tritònia, Ìxia, Trichonèma, and Cròcus.

The Iris has generally tuberous or solid bulbous roots, of the kind called corms; and the perianth of the flower is divided into six segments, three of which are larger than the others: these three larger segments, which form the calyx, are reflexed, and a stamen springs from the base of each, which reclines upon it, with its anther turned from the rest of the flower, the segment, in many of the species, having a kind of crest or beard near the base, as though it were intended to form a cushion for the stamen to repose on, while over each stamen is spread, as a kind of coverlid, a stigma which is dilated so as to resemble a petal. The petals often stand erect. The seed-vessel, which forms below the flower, is a three-celled capsule, opening, when ripe, by three valves, and containing numerous seeds.

The other genera differ from the Iris in having the lower part of the segments of the perianth generally combined into a tube, with the ovary below looking like a footstalk; the limb being divided into six parts, all so much alike, both in form and position, as to render it difficult to distinguish the calyx from the corolla. There is only one style, with three stigmas, which are always more or less leafy; and the anthers (which are never more than three) are always turned away from the pistil. In Ferrària, the filaments of the stamens grow together, and form a hollow tube (as in the Passion-flower) surrounding the style and stigmas; and in the Saffron Crocus (*C. satìvus*), the stigmas (which, when dried, form the saffron) are so heavy, as to hang out on one side of the perianth from between the segments. Most of the genera have solid bulbs or corms at the base of their stems; but some, such as Márica, Sisyrínchium, and Patersònia, have only fibrous roots.

The violet-scented Orris-root is the produce of *Ìris florentìna*. The roots of *I. germánica,* when dry, also smell like violets. The roasted seeds of *Ìris Pseùdácorus* are said very nearly to approach Coffee in quality. The valuable colouring matter of Saffron has the singular property of entirely disappearing under the influence of the sun's rays.

Order 188. HÆMODORÀCEÆ.

Herbaceous plants, with fibrous perennial roots, natives, with very few exceptions, of the Cape of Good Hope and New Holland. The species differ chiefly from the Irídeæ in having six stamens, the anthers of which are turned towards the stigma.

The name of this order, derived from *haima,* blood, indicates its most striking peculiarity, the roots of several species of Hæmodòrum, Wachendórfia, and Heritièra, yielding a brilliant crimson dye.

The best known genera are Wachendórfia, Hæmodòrum, Barbacènia, and Anigozánthos.

Order 189. HYPOXÍDEÆ.

Tuberous or fibrous-rooted herbaceous plants, with long narrow leaves, covered with soft downy hairs, and rather small sweet yellow flowers. Natives of America, New Holland, the Cape of Good Hope, Polynesia, and the Indian Archipelago.

Order 190. AMARYLLÍDEÆ.—THE AMARYLLIS FAMILY.

A large order of bulbous-rooted plants, most of them having very lovely flowers, the colours of which vary from white and yellow to deep scarlet and azure blue. In fragrance many of them vie with the violet and the primrose. Some of the species are natives of thickets in the cooler regions of Europe and Asia; others are found deep-rooted in the burning shores of islands where scarcely a blade of grass interposes itself between them and the rays of a scorching sun; many spring up in the gloomy, damp, and sultry woods of equinoctial America; and another set intermingles with the Ixias and Gladioluses of Southern Africa.

Some of the most interesting and best known genera are, Galánthus (the Snowdrop), Leucòjum, Ixiolírion, Amarýllis, Hippeástrum, Vallòta, Nerìne (the Guernsey Lily), Brunsvígia, Crìnum, Hæmánthus, Phædranássa, Pancràtium, Narcíssus, Alstrœmèria, Clívia, and Doryánthes.

The different kinds of Amarýllis have large lily-like flowers, divided into six equal segments, which are joined into a tube below, with six stamens, the anthers of which are turned towards the pistil, and a long style crowned with a simple stigma. The ovary is beneath the other parts of the flower, to which it serves as a receptacle; and in most of the plants it looks like a small green calyx below the perianth. The leaves are very long, but they are rather thick and fleshy, and their edge is not turned towards the stem. In Narcíssus, Pancràtium, and some other genera, the flowers have a kind of cup within the perianth, formed by the filaments of abortive stamens, grown together. In Pancràtium, the filaments of the anther-bearing stamens grow into the others, so as to form a part of the cup, the anthers springing from the margin of it; but in Narcíssus the fertile stamens are distinct. In Galánthus, and its allied genera, the anthers open by pores, as in the Ericàceæ; and there is a kind of receptacle on the germen, in which the petals and sepals, and the filaments of the stamens are inserted.

Order 191. HEMEROCALLÍDEÆ.—THE DAY LILY FAMILY.

These are fine showy plants, bearing their flowers (which are white, yellow, red, or blue) in umbels or racemes. They are mostly inhabitants of temperate zones, and, with the exception of the Aloe, are of little utility. The Aloe is besides remarkable among Monocotyledons for its fleshy leaves, in which, and in its woody stem, it offers a striking deviation from the usual structure of these plants.

The best known genera of the order are, Hemerocállis (the Day Lily), Fúnkia, Agapánthus, Poliánthes (the Tuberose), Blandfórdia, Trítoma, Veltheìmia, and Áloe.

Order 192. DIOSCORIÈÆ.—THE YAM FAMILY.

These are twining or climbing plants with broad cordate or angular leaves, inconspicuous flowers, and large fleshy tuberous roots. The roots of the Yam (the representative of the order) yield one of the most important articles of food in tropical countries.

The two principal genera are Dioscòrea (the Yam), and Testudinària (the Elephant's Foot).

Order 193. TÀMEÆ.—THE BLACK BRYONY FAMILY.

Twining herbaceous plants with large tuberous roots, heart-shaped leaves, and racemes of small axillary flowers. The only genus is Tàmus (the Black Bryony), the roots of which are dangerous.

Order 194. SMILÀCEÆ.—THE SARSAPARILLA FAMILY.

Herbaceous plants or undershrubs, some having fleshy tubers. Some are interesting, especially the Lily of the Valley, a species of Convallària, the odour of which is most grateful; Smìlax, which is remarkable for its twining stems and its leaves, which resemble those of dicotyledons, and the roots of several species of which afford the sarsaparilla of the shops; and the Butcher's Broom (Rúscus). In the genus Smìlax the male and female flowers are on different plants; and in Rúscus the flowers spring from the middle of the leaves. The perianth is in six equal segments, and there are six stamens. The ovary is three-celled, with the cells one or many-seeded, and the fruit is a globose berry. The seeds, when ripe, have a brown membranous skin.

The principal other genera are, Ripógonum, Polygónatum, Smilacìna, Pàris, and Trìllium.

Order 195. ASPHODÈLEÆ.—THE ASPHODEL FAMILY.

Herbaceous plants, shrubs, or trees, with bulbous, tuberous, or fibrous roots, uncommon in tropical countries, very abundant in temperate latitudes, and not unfrequent in the colder regions of the world. Many of these plants have tunicated bulbs, that is, bulbs consisting of several fleshy tunics or coats, which may easily be separated from each other, as may be seen in the hyacinth and the onion. The leaves are fleshy, and ligulate or strap-shaped; and the stems are frequently hollow. The flowers are generally in upright racemes or umbels; they are regular and sometimes bell-shaped: the perianth is divided into six segments, which are sometimes partly united into a tube, and recurved at the tip. There are six stamens attached to the perianth; and the fruit is either a fleshy or dry three-celled capsule, generally with several seeds, and opening into three valves when ripe. The order contains many well-known plants, as the Hyacinth (Hyacínthus), the

Squill (Scílla), the Onion (Állium), the Grape Hyacinth (Muscàri), the Star of Bethlehem (Ornithógalum), and the Asparagus. While other genera not so well known are: Asphódelus, Anthéricum, Albùca, Gàgea, Lachenàlia, Triteleìa, Dracæ̀na (the Dragon tree), Phórmium (the New Zealand Flax), and Thysanòtus (the fringed Violet of New Holland), which has rich purple flowers with long delicate fringes which sparkle in the sun, as if continually bedewed with minute particles of water.

Order 196. TULIPÀCEÆ.—THE TULIP FAMILY.

These are plants of great beauty, inhabitants of either cold or temperate latitudes. They all have a regular perianth of six segments, with six stamens, and a dry or fleshy capsule of three cells, opening by as many valves. Some of the genera have more seeds than others, and some of the seeds have a hard, dry, black skin, while others have the skin spongy and soft. Included in the order are the lovely Lilies (Lílium), the gorgeous Tulips (Tùlipa), the stately Yúcca or Adam's Needle, the pretty Fritillary (Fritillària), the splendid Gloriòsa, and the humble little Dog's Tooth Violet (Erythrònium). Some of the plants have the flowers erect and single, as in the Tulip; in others the flowers are erect but in umbels, as in the Orange Lily; and in others they are in racemes and drooping as in the Yúcca, or single and drooping as in the Fritillary, or with the segments curved back as in the Martagon Lily. Some of the Japan Lilies are most delightfully fragrant. The most striking of these is *Lílium auràtum.*

Order 197. Melanthàceæ.

Bulbous, tuberous, or fibrous-rooted herbaceous plants, many of which have inconspicuous dull-green or yellow flowers. All the species have a poisonous

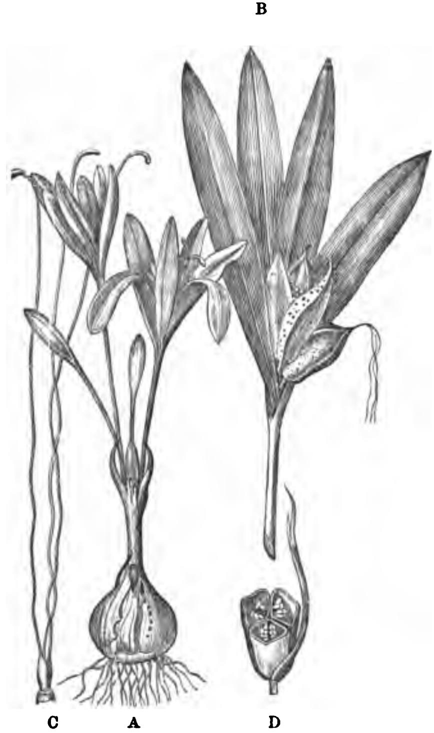


Fig. 139.—Cólchicum autumnàle. A, bulb with flowers; B, bunch of leaves and capsules; C, ovarium and styles; D, seed-vessel cut across.

acrid juice, which is particularly active in the genera Cólchicum and Veràtrum. They are frequent at the Cape of Good Hope, not uncommon in Europe, Asia, and North America, and exist within the tropics of India and New Holland. The genera Cólchicum and Bulbocòdium have flowers like the Cròcus. The bulbs of the Cólchicum are used in medicine: they are the basis of the eau médicinale. The root of Veràtrum is believed to have been the Hellebore of the ancients. Cólchicum and Bulbocòdium are distinguished from the genus Cròcus, which they so strongly resemble in the appearance of their flowers, by the ovary being within the flower instead of below it, and by their having three distinct styles, instead of one style and three stigmas. The *Cólchicum autumnàle* (Common Meadow Saffron) is a British plant, flowering in September or October.

Order 198. BROMELIÀCEÆ.—THE PINE-APPLE FAMILY.

The well-known Pine Apple is the representative of this order, which consists of plants with rigid leaves furnished with spines and covered with minute scales, and bracts often coloured with scarlet, the flowers being either white or blue. They are all natives of the continent or islands of America, whence they have migrated eastwards in such numbers as to have established themselves as part of the present Flora of the west coast of Africa, and some parts of the East Indies.—Some of the best known plants of the order are, the Pine Apple (*Bromèlia Anànas*), the American Aloe (*Agàve americàna*), Billbérgia, the very striking *Bonapártea júncea* (once called *Littæa geminiflòra*), and the curious epiphyte Tillándsia, which, in the humid woods of

Carolina, forms dense festoons among the branches of the trees.

Order 199. PONTEDÈREÆ.

Elegant aquatic or marsh plants, usually with kidney-shaped leaves, and spikes or racemes of blue, white, or yellow flowers. They are natives of North and South America, the East Indies, and tropical Africa. The principal genus is *Pontedèria.*

Order 200. COMMELÍNEÆ.

These are herbaceous plants, mostly natives of the East and West Indies, New Holland, and Africa: a few are found in North America, but none in Europe. Many are elegant plants, usually with blue, reddish, or white flowers (blue being the prevailing colour of the order). The best known plants of the order are, the Spiderwort (*Tradescántia*), the beautiful *Commelìna cœléstis, Cyanòtis,* and *Dichorizándra thyrsiflòra* with its noble thyrses of blue flowers.

Order 201. PÁLMEÆ.—THE PALM FAMILY.

The Palms may well be called the princes of the Vegetable world, for they surpass nearly all other plants in their grandeur and majesty. They are, too, of immense value to mankind, as they afford food and raiment, and are applicable to various purposes of economical importance. Many are lofty trees, bearing a tuft of large leaves, called fronds, at the summit. The flowers are small, with bracts, and they are enclosed in a spathe, which bursts on the under-side. The mass of flowers is called a spadix. The fruit when ripe is either a drupe or a berry, with either a fibrous or a fleshy coat. In the Cocoa-nut Palm (*Còcos nucífera*) the fruit is a drupe; and the outer covering consists of hard, dry, fibrous matter, which is uneatable, the only part that can be eaten being the albumen of the kernel. The Date

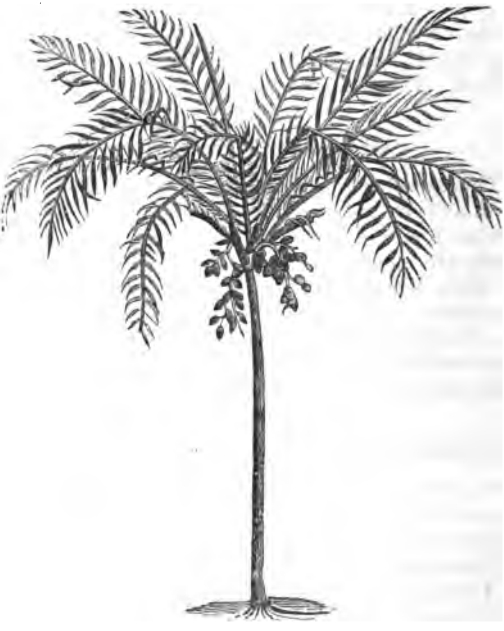


Fig. 140.—Cocoa Nut Palm.

Palm (*Phœnix dactylífera*), the Sago Palm (*Sàgus Rúmphii*), the *Phytélephas macrocárpa*, which furnishes the Vegetable Ivory, and many others, are valuable for their products.

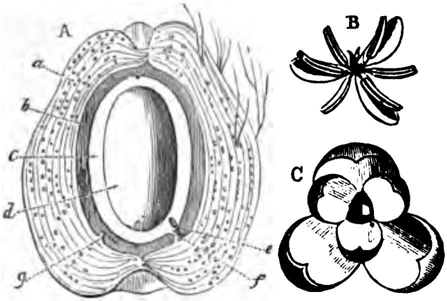


Fig. 141.—Flowers and Fruit of the Cocoa Nut Palm. B, staminiferous flower; C, pistilliferous flower. A, section of fruit; *a*, husk, or pericarp; *b*, shell, or endocarp; *c*, albumen; *d*, cavity within it; *e*, embryo; *f*, aperture of shell; *g*, rudiment of other aperture.

Order 202. Pandàneæ.—The Screw-Pine Family.

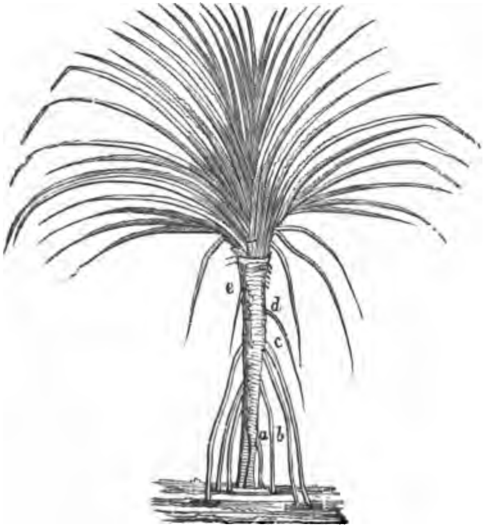


Fig. 142.—Pandànus or Screw-Pine. *a*, *b*, *c*, aërial roots, partly serving as stems; *d*, *e*, roots that have not yet reached the ground.

These are trees or bushes, sometimes sending down aërial roots. They are mostly tropical. The most interesting plant in the order is the Screw Pine (Pandànus), which has the habit of the Palms, but the flowers of the Arum Family. The flowers of *Pandànus odoratíssimus* and the fruit of some of the other species are eaten.

Order 203. TȲPHINÆ.—THE BULLRUSH FAMILY.

These are reed-like plants, with creeping roots, commonly found in the ditches and marshes of the northern parts of the world, but uncommon in tropical countries. The Bullrush (Tȳpha) is so common in Britain that it is known by every one. This plant is also called Cat's-tail and Reed-Mace. The other genus of the order is Spargànium (the Bur-Reed), which is also British.

Order 204. AROÍDEÆ.—THE ARUM FAMILY.

Herbaceous plants, frequently with a fleshy corm; or shrubs; stemless or arborescent, or climbing by means of aërial roots. Some are natives of Europe, but the greater number inhabit the tropics, where they often climb by their rooting stems to the tops of lofty trees. The flowers of these curious plants are enclosed within a spathe, and are embedded on a simple cylindrical spadix, the male and female flowers being separate, the former above the latter. The male flowers have only one stamen in each without any covering, and the female flowers have only a single ovary. The fruit consists of a cluster of red berries, which form round the spadix. Many of these plants have a very unpleasant smell. Some have tuberous roots, which, when cooked, are eaten, though they are poisonous when raw. *Àrum* or *Calàdium esculéntum* is thus eaten as a common article of food in the East Indies. While the Dumb Cane (*Àrum* or *Calàdium seguìnum*) has received its English name from the leaves being so poisonous

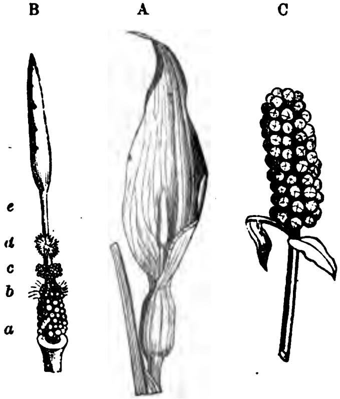


Fig. 143.—Àrum maculàtum. A, spathe with spadix enclosed; B, spadix separated, showing *a*, ovaries; *b* and *d*, abortive ovaries; *c*, staminiferous flowers; *e*, naked part of the spadix; C, cluster of berries ripened on the spadix.

that if chewed they deprive one of the power of speaking. The beautiful plant commonly called the White Arum (*Cálla* or *Richárdia æthiópica*) belongs to this order, as does the fragrant Rush or Sweet Flag (*Ácorus Cálamus*).

Order 205. Fluviàles.—The Pondweed Family.

These are floating plants, inhabiting both the ocean and fresh water. One of the most interesting plants of the order is *Aponogèton distàchyon*, a native of the Cape of Good Hope, which has deeply-ribbed leaves on very long footstalks, and fragrant flowers in two-cleft spikes, with snow-white bracts. The Duckweed (Lémna), and also Potamogèton, Nàjas, Zannichéllia, Rúppia, and Zóstera belong to this order.

Order 206. JÚNCEÆ.—THE RUSH FAMILY.

These are, with two or three exceptions, rigid worthless weeds. They clothe cold, wet, barren land in most parts of the world.

Order 207. GILLIESIÈÆ.

These are small herbaceous plants with tunicated bulbs. Gillièsia, the principal genus, contains one species, a grass-like plant with greenish-yellow flowers, a native of Chili.

Order 208. RESTIÀCEÆ.

Rigid, inelegant, and often leafless plants, with the habit of rushes, chiefly natives of the Cape of Good Hope and New Holland.

Order 209. CYPERÀCEÆ.—THE SEDGE FAMILY.

The sedges have solid stems, and the sheath at the base of the leaves is closed up so as to form a kind of tube. They are of little value as objects of ornament. The flowers are arranged in heads, some of which contain only male flowers, consisting of a membranous scale and three stamens; and others contain only female flowers. The most important genera are: Càrex (the Sedge), Papỳrus (the plant anciently used for making paper), Scírpus (the Club Rush), used for making the seats of chairs, mats, &c., Erióphorum (the Cotton Grass), and Cypèrus.

Order 210. GRAMÍNEÆ.—THE GRASS FAMILY.

This is a very important order, containing not only the common Grasses, but the Wheat, Oat, Barley, Rye, and Maize, and the Sugar-cane and Rice.

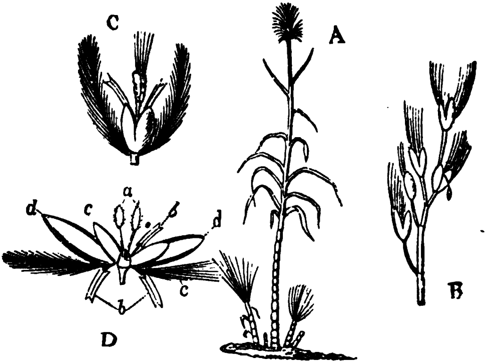


Fig. 144.—Sugar-cane with its flowers. A, whole plant; B, cluster of flowers enclosed in glumes; C, single flower enlarged, with glumes separated; D, flower opened, showing *a*, stigmas, *b b*, stamens, *c*, scales, *d*, paleæ.

The stems of all these plants are hollow, except at the joints, where they become solid; and their leaves, though sheathing the stem, do not unite round it. The leaves are alternate, springing from each joint. The flowers are produced in spikes composed of a number of spikelets, or in loose panicles like oats. The glume, or calyx as it was called by Linnæus, is generally two-valved; and within it are two thinner, smaller scales, or paleæ, which were called the corolla by Linnæus. Besides these, there are frequently two still smaller scales within the paleæ. There are generally three or six stamens, the anthers of which are two-celled, and forked at the extremity. There are two styles, either quite distinct, or combined at the base, and the stigmas are feathery. The pericarp is membranous and adheres to the seed, forming a kind of caryopsis. The seeds contain a great deal of albumen, which, when ground into flour, becomes nourishing food. Some of the most important genera are, Tríticum (the Wheat), Hórdeum (the Barley), Secàle (the Rye), Avèna (the Oat), Zèa (the Maize, or Indian Corn), Sáccharum (the Sugar Cane), Orӯza (the Rice), and Bambùsa (the Bamboo Cane). Many of the grasses are extremely pretty and elegant

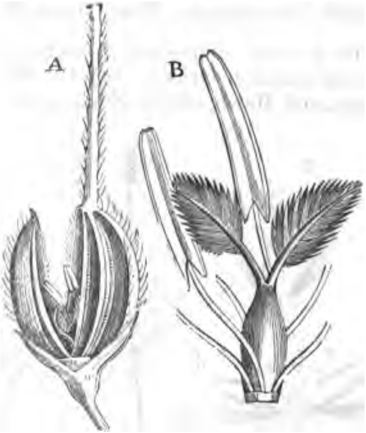


Fig. 145.—Flower of rice, enlarged. A, showing paleæ and awn; B, ovarium of stigmas, with two of the six stamens.

when in flower, as the Bent Grass (Agróstis), the Canary Grass (Phálaris), the Water Reed (Arúndo), the Feather Grass (Stìpa), the Hair Grass (Aíra), the Quaking Grass (Brìza), and the Meadow Grass (Pòa). The large spikes of the Pampas Grass (*Gynèrium argénteum*) are most noble and striking.

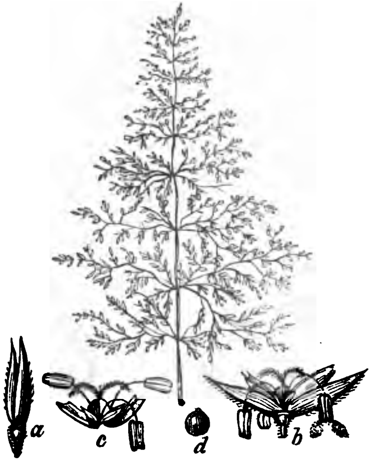


Fig 146.—Agróstis capillàris. *a*, the bivalvular one-flowered glume; *b*, the same opened, showing the flower; *c*, the flower taken out to show the leaves of the calyx, and the two scales; *d*, the seed.

Second Grand Division.—CELLULÀRES.

Class I.—FOLIÀCEÆ.

Order 211. FÍLICES.—THE FERN FAMILY.

Ferns are very curiously constructed. The stem is perennial, often subterraneous and creeping, and occasionally becoming arborescent and leafy above the ground. The fronds or leaves are usually pinnatifid, and more or less compound, sometimes nearly simple and entire, with forked veins. On the under side of the fronds are some curious brown spots of various shapes called sori (see fig. 147); and these, which generally form under the outer skin or cuticle of the leaf, and which always spring from one of the veins, contain a number of small grains, called thecæ, which are in reality cases containing the sporules or seeds. When the sorus

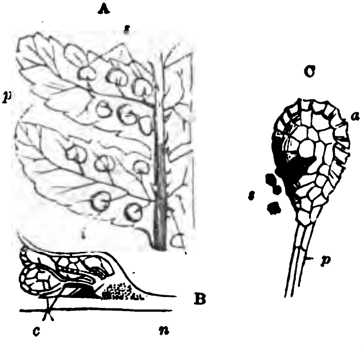


Fig. 147.—Fructification of Fern. A, portion of frond of *Nephròdium angulàre*, showing the sori, *s*, on the under side of two pinnules, *p*:—B, vertical section of a sorus; *n*, the nerve which bears it; *i*, indusium; *c*, capsules:—C, one of the capsules at the moment of rupture; *a*, annulus, or cellular ring; *p*, pedicel; *s*, spores escaping.

forms under the cuticle of the leaf, the membranous part raised, which resembles a blister, is called the indusium; but sometimes the sori are naked, that is, they are formed on the outside of the cuticle; and sometimes they are found on the margin of the leaf, which folds over them, and supplies the place of the indusium. The thecæ are generally on stalks, and they are also generally furnished with a ribbed, elastic, articulated but incomplete ring, which seems to serve as a sort of hinge when they burst. This elastic ring is a continuation of the stalk of the theca, which always bursts on the opposite side.

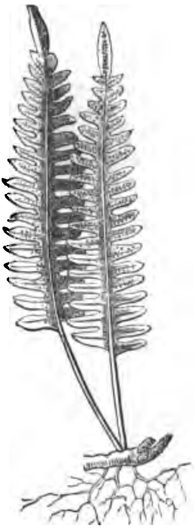


Fig. 148. — Polypòdium vulgàre, common Polypody, or Wall-Fern.

The order is generally divided into two sections, called Polypodiàceæ and Osmundàceæ. The first contains those ferns which unroll their fronds when they rise from the stem, and which have their sori either on the back or on the margin of the frond. Some of the genera in this division are: Polypòdium (the Polypody), the sori of which are without any indusium, Aspídium (the Shield Fern), Cystópteris (the Bladder Fern), and Asplènium (Spleenwort), all of which have their fronds pinnate or pinnatifid; Adiántum (the Maiden Hair), Scolopéndrium (the Hart's-tongue), the frond of which is simple and shaped like a tongue, and the sori are oblong, and Ptèris (the Brake or Bracken), the fronds of which are pinnatifid, with the sori placed round the margin so as to form a continuous line, and the edge of the frond turned over them. The rhizoma of the Brake is eaten in many countries, and the fronds, when burnt, yield alkali, which is used in making both soap and glass.

The second division, Osmundàceæ, comprises those ferns which apparently have flowers: the flowers, however, being sori, with the fronds on which they grew shrivelled up round them. The most remarkable of these is the Flowering Fern (*Osmúnda regàlis*); but others are the Grape Fern or Moonwort, (Botrýchium), a species of which, a native of North

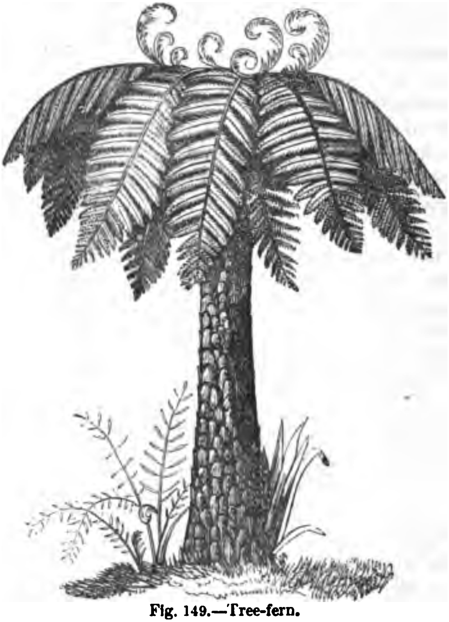


Fig. 149.—Tree-fern.

America, is called there the Rattlesnake Fern, and the Adder's-tongue (Ophioglóssum).

The Tree Ferns are magnificent plants. The trunk or stipe rises in some to the height of forty or fifty feet, without a branch, and then terminates in a head of noble fronds, which hang down on every side like a plume of feathers.

Order 212. EQUISETÀCEÆ.—THE HORSE-TAIL FAMILY.

These are well-known marsh plants. The thecæ are contained in terminal cone-like spikes or catkins, from four to eight lying in each scale. The stems are tubular and articulated, with whorls of membranous sheaths, and of slender branches, jointed and sheathed like the stem at every joint. All the species of Equisètum abound in siliceous matter, and particularly *E. hyemàle* (the Dutch Rush), which is used for polishing both wood and metal. The most striking species is *E. sylváticum.*

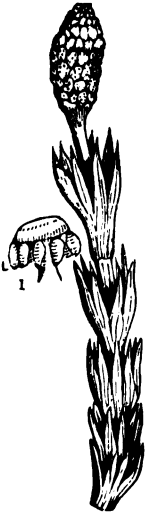


Fig. 150.—Equisètum arvénse; 1, a peltate disk, with its attached spore-cases, separated and seen from the side.

Order 213. LYCOPODÍNEÆ.—THE CLUB MOSS FAMILY.

These are intermediate between the Ferns and the Mosses. They are herbaceous, usually prostrate plants, with imbricated simple leaves. In some of the species the thecæ are produced in the axils of the leaves, and in others in erect bracteated spikes. Some of the species are used as dyes. The sporules of *Lycopòdium clavàtum* are said to be employed for ameliorating wine, and are also used in making fireworks, on account of their inflammable nature. The principal genera are Lycopòdium and Selaginélla.

Order 214. MARSILEÀCEÆ.

These are aquatic plants, the thecæ of which are always found in the axils of the leaves near the root. Marsílea, which gives the name to the order, is a native of Italy and other parts of the South of Europe, where it grows in the same manner as Duckweed does with us. The genera Isoètes (the Quillwort) and Pilulària (the Pillwort) are British plants.

Order 215. MÚSCI.—THE MOSS FAMILY.

The Mosses have fibrous roots and slender wiry stems, densely covered with leaves, which are very small, and laid over each other like scales. The

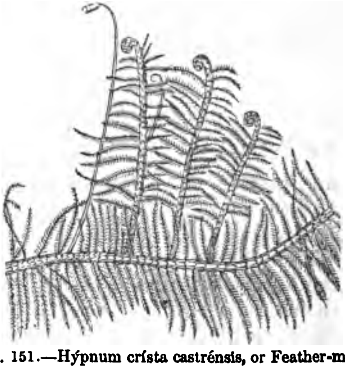


Fig. 151.—Hýpnum crísta castrénsis, or Feather-moss.

theca is urn-shaped, and it is produced singly; in most cases on a long, slender, wiry stem, called a seta, which signifies a bristle, but sometimes without any stalk. It always springs from a tuft of leaves differing both in size and shape from the ordinary leaves. Among these may occasionally be seen a few stalks terminating in a kind of cup, and thickened at the base. The cups and upper parts soon die away, and the thicker part left among the leaves swells, and in time rises on a stalk of its own, carrying away one of the leaves with it on its head. This is the theca, and the leaf it carried away, and which resembles an extinguisher: it is called a calyptra, and it remains on till the sporules are nearly ripe. When the calyptra falls, the theca is found to be covered with a little lid called the operculum, which also falls off in time, and shows the mouth or stoma of the theca. This mouth is sometimes naked, and sometimes covered with a kind of film; but generally it is surrounded by a row of long, slender, hair-like teeth called the peristome or fringe. When there are two rows of these hair-like teeth, the inner ones, which are finer than the others, are called cilia; and the number of both the cilia and the teeth is always some number that can be divided by four. In the cavity of the theca is a central axis called the columella, and around that are found the sporules, kept together by the lining of the theca,

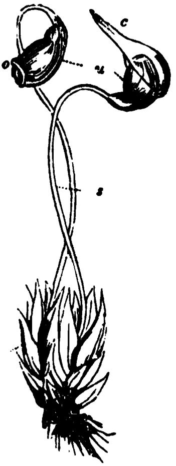


Fig. 152.—Funària hygrométrica, or hygrometric cord-moss; *f*, leaves; *u*, urns supported by the footstalk *s*; *o*, operculum; *c*, calyptra.

which forms a kind of open bag. This is the usual construction of all the numerous genera of mosses; but in some kinds, as for example in the Hair Moss (Polýtrichum), in addition to the theca, a number of granules are found among the leaves, which are said to be capable of producing young plants.

Order 216. HEPÁTICÆ.

These plants very much resemble Mosses in their appearance, but they differ in their construction.

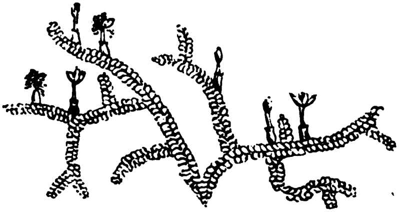


Fig. 153.—Jungermánnia, one of the Hepáticæ, or Liverworts.

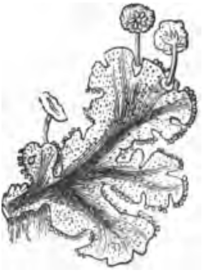


Fig. 154.—Marchántia polymórpha, one of the commonest of the Liverworts.

The theca has no lid, but bursts into valves, and it generally contains not only sporules, but tubes formed of curiously twisted threads, called elaters. Jungermánnia and Marchántia have a calyptra, which the other genera are without; and in Jungermánnia the theca has a sort of sheath, which is sometimes called the calyx. There are also stalked granules called anthers, and warts which form on the leaves, and break up into what look like sporules.

Class II. APHÝLLÆ.

Order 217. ÁLGÆ.—SEA WEED.

These plants can grow only where there is abundance of moisture, and many of them, such as the different kinds of Fùcus, inhabit the sea. Others are found in the form of Confévræ, or green slime, on the surface of stagnant ponds, or on damp stone or gravel walks; and others appear to form one of the connecting links between animal and vegetable life. The Álgæ are divided into three classes, viz.: the jointless, the jointed, and the disjointed. The jointless Álgæ are by far the most numerous, and they comprise all those broad flat jelly-like substances which are called by the names of tangle and dulse on the sea-coast, and which are frequently eaten. To this division also belong the kinds of sea-weed that

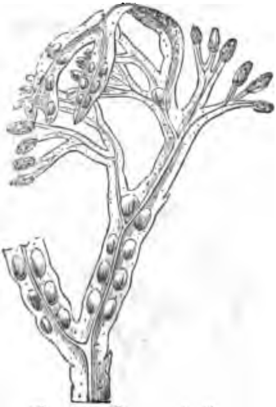


Fig. 155.—Fùcus vesiculòsus.

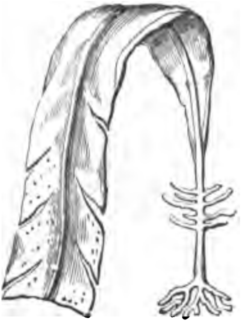


Fig. 156.—Alària esculénta. (Baddelocks, or Balderlocks.)

were formerly used for making kelp; those from which iodine is procured; those formerly erroneously supposed to be used in forming the celebrated Chinese birds' nests; those sold in the shops under the name of laver; and those used by farmers as manure. Of the jointed Álgæ, the Confervæ are well known from the rapidity with which they form a thick green slime on the surface of ditches and ponds, and wherever there is stagnant water exposed to the open air. The disjointed Algæ are generally found among the Confervæ; but they are so small as in many cases entirely to escape notice.

Order 218. LICHÈNES.—LICHENS.

Lichens are perennial plants, often spreading over the surface of the earth, or rocks, or trees, in dry places, in the form of a lobed and foliaceous, or hard and crustaceous substance, called a thallus, the branches of which are called podetia. The spores or sporules are produced in what are called shields, which are generally embedded in the thallus, and which, when they are cup-shaped, are called scyphæ, and when flat, apothecia. The sporules, which are very numerous, are enclosed in receptacles of various forms, which are embedded in the shields. Some of

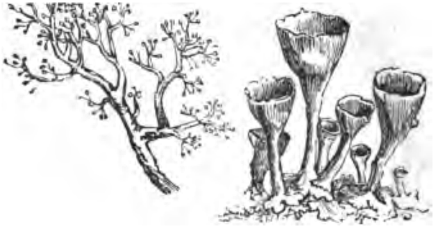


Fig. 157.—Lichens.

the commonest lichens are *Ŭsnea flórida* and *Ramalìna fastigiàta*, both of which are found on old oaks (and the latter sometimes also on rocks), and are generally called grey moss; and *Corniculària heteromálla* is a brown mossy-looking lichen, often found on the bark. Other and more interesting lichens are the Iceland Moss (*Cetrària islándica*), the Reindeer-moss (*Cenómyce,* or *Cladònia rangiferìna*), the Cup-moss (*Cenómyce pyxidàta*), the Orchall (*Roccélla tinctòria*), and *Parmèlia perforàta.* Lichens are not only most useful in the economy of nature, as preparing the surface of the earth for the reception of larger vegetables, but they are, moreover, of great utility to man. Many have a bitter principle, and are tonic and nutritive. Others are used for dyeing.

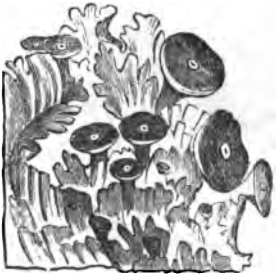


Fig. 158.—Parmèlia perforàta: Lichen with projecting shields.

Order 219. FÚNGI.—FUNGUSES.

The Funguses are divided into several distinct sections, one of the most important being that containing the mushrooms. The genus Agáricus is one of the largest in this division, and the plants belonging to it consist of a stipe or stalk (*p*, in fig. 159), surmounted by the pileus or cap (*c*, in fig. 159). When the mushroom first appears, the stalk is covered by a thin membrane, called the veil (*v*), which unites the cap to the lower part; but as the mushroom grows, this veil is rent asunder, and it either entirely disappears, or only a small portion of it remains round the stalk, which is called the annulus or ring (*a*). Under the cap are the gills or lamellæ (*h*), and attached to these are the thecæ, containing the sporules or seeds. In the common Mushroom (*Agáricus campéstris*) the gills are pink when the veil breaks, which it does very soon, and they become afterwards of a dark brown or nearly black. In all the poisonous kinds the veil is longer before it breaks, and when it does so, the gills are generally pale, and frequently nearly white, without becoming darker. The smell is also quite different. The Mushroom tribe, which includes all the Fúngi which carry their sporules in the part above the stem, is divided into two sections, viz.: those with caps, like the Mushroom, and those which are slender and entire, but club-shaped in the upper part, like *Clavària hélvola,* a fungus often found in meadows.

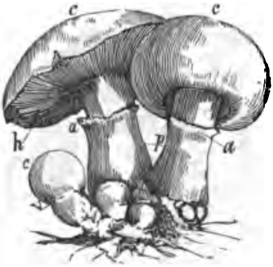


Fig. 159.—A group of Mushrooms (*Agáricus campéstris*): *p*, the stalk, or stipe; *c*, cap, or pileus; *v*, the veil, which at first unites the stalk to the cap, and afterwards, when broken, forms the annulus, *a*; *h*, lamellæ.

The Morel tribe includes those Fúngi which have their sporules in the stipe, and it is separated into two divisions, the first of which includes those which, like the Morel (*Morchélla esculénta*), have a pileus, or cap, like a mitre; and the second, thôse which have the pileus curving upwards, like a cup, as in Pezìza. A third tribe includes those which, like Tremélla, are of a jelly-like substance; and in a similar manner all the other numerous genera are arranged. Among these some of the most remarkable are, the Truffle (*Tùber cibàrium*), which is found buried in the earth; the

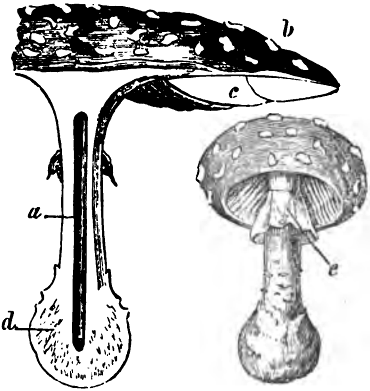


Fig. 160.—Amanìta muscària: *a*, the hollow stipes or stem; *b*, the pileus or cap; *c*, the lamellæ or gills; *d*, the volva or wrapper; *e*, the velum or veil.

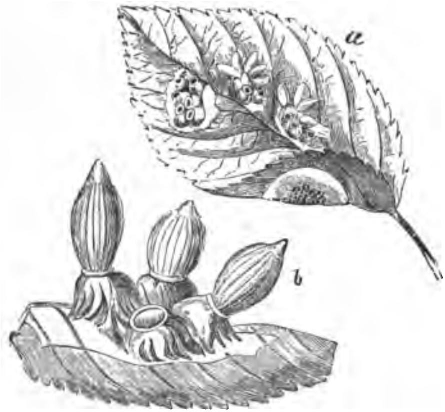


Fig. 161.—Ecídium cancellàtum : *a*, a leaf upon which it is seen growing of the natural size; *b*, peridia, magnified.

Puff-Ball (*Lycopérdon Bovísta*); and the curious Fúngi called Blight and Mildew, which belong to several different genera, and which appear on the leaves and fruit of other plants.

Many of the fungi are eatable besides the common Mushroom, the Morel, and the Truffle; others are very poisonous; some are used medicinally. Fúngi are found in most parts of the world, but they are most abundant in moist temperate regions.

Fly-agaric is the common name by which the *Amanìta muscària* (formerly called *Agáricus muscàrius*) is known. This fungus (see fig. 160) is the ornament of beech woods in most parts of Britain, its stately appearance and the bright vermilion of its pileus, studded with white or yellow warts, rendering it an object of admiration. It is a very poisonous kind, producing, when eaten, intoxication.

Dry rot is a fungus most destructive to timber in houses and in dockyards.

The *Æcídium cancellàtum* (fig. 161), usually found on the leaves and fruit of pear-trees, is one of the species of a genus of Fúngi consisting of a large number of parasites which grow upon the living parts of other plants.

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